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DEPARTMENT OF ENERGY

10 CFR Part 431

[EERE-2017-BT-STD-0022]

RIN 1904-AE47

Energy Conservation Program: Energy Conservation Standards for Automatic Commercial Ice Makers

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 (EPCA), as amended, prescribes energy conservation standards for various consumer products and certain commercial and industrial equipment, including automatic commercial ice makers. EPCA also requires the U.S. Department of Energy (DOE) to periodically determine whether more stringent standards would be technologically feasible and economically justified, and would result in significant energy savings. In this notice of proposed rulemaking (NOPR), DOE proposes to amend and establish energy conservation standards for automatic commercial ice makers and 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 NOPR no later than [**INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER***].

Meeting: DOE will hold a meeting via a webinar on Wednesday, June, 14, 2023, from 1:00 p.m. to 4:00 p.m.. See section VII, "Public Participation," for webinar registration information, participant instructions and information about the capabilities available to webinar participants.

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

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov* under docket number EERE–2017–BT–STD-0022. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2017-BT-STD-0022, by any of the following methods:

(1) *Email: ACIM2017STD0022@ee.doe.gov*. Include the docket number EERE-2017-BT-STD-0022 in the subject line of the message.

(2) *Postal Mail:* Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, Mailstop EE-5B, 1000 Independence Avenue, SW, Washington, DC, 20585-0121. Telephone: (202)

287-1445. If possible, please submit all items on a compact disc (CD), in which case it is not necessary to include printed copies.

(3) *Hand Delivery/Courier:* Appliance and Equipment Standards Program, U.S. Department of Energy, Building Technologies Office, 950 L'Enfant Plaza, SW, 6th Floor, Washington, DC, 20024. Telephone: (202) 287-1445. If possible, please submit all items on a CD, in which case it is not necessary to include printed copies.

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

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

The docket webpage can be found at *www.regulations.gov/docket/EERE-2017-BT-STD-0022*. The docket webpage contains instructions on how to access all documents, including public comments, in the docket. See section VII of this document for information on how to submit comments through *www.regulations.gov*.

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

FOR FURTHER INFORMATION CONTACT:

Ms. Julia Hegarty, 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) 586-0729. Email: *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Kristin Koernig, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW, Washington, DC, 20585-0121. Telephone: (202) 586-3595. Email: *Kristin.Koernig@hq.doe.gov*.

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

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Synopsis of the Proposed Rule

The Energy Policy and Conservation Act, Pub. L. 94-163, as amended (EPCA),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part C of EPCA,[2] established the Energy Conservation Program for Certain Industrial Equipment. (42 U.S.C. 6311–6317) This includes automatic commercial ice maker (ACIM) equipment, the subject of this proposed rulemaking.

Pursuant to EPCA, any new or amended energy conservation standard must be designed to achieve the maximum improvement in energy efficiency that DOE determines is technologically feasible and economically justified. (42 U.S.C. 6316(a); 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. 6316(a); 42 U.S.C. 6295(o)(3)(B)) EPCA also provides that, not later than 6 years after issuance of any final rule establishing or amending a standard, DOE must publish either a notice of determination that standards for the equipment do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m))

In accordance with these and other statutory provisions discussed in this document, DOE proposes to amend energy conservation standards for automatic commercial ice makers and to establish new energy conservation standards for covered equipment not yet subject to energy conservation standards. The proposed standards,

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflects the last statutory amendments that impact Parts A and A-1 of EPCA.

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

which are expressed in the maximum allowable energy use as a function of the harvest rate of the given equipment, are shown in Table I.1 and Table I.2. These proposed standards, if adopted, would apply to all automatic commercial ice makers listed in Table I.1 and Table I.2 manufactured in, or imported into, the United States on or after the date that is (1) 3 years after the date on which the final amended standard is published or (2) if the Secretary determines, by rule, that 3 years is inadequate, not later than 5 years after the date on which the final amended standard is published. (42 U.S.C. 6313(d)(2)(B) and (3)(B))

DOE notes that the U.S. Environmental Protection Agency (EPA) proposed refrigerant restrictions pursuant to the American Innovation and Manufacturing Act (AIM Act)[3] affecting automatic commercial ice makers in a NOPR published on December 15, 2022 (December 2022 EPA NOPR). 87 FR 76738. The proposal would prohibit manufacture or import of such ice makers starting January 1, 2025, and would ban sale, distribution, purchase, receipt, or export of such ice makers starting January 1, 2026. *Id.* at 87 FR 76809. See section IV.A.5.a of this document for more details. DOE understands that it would be beneficial to ACIM equipment manufacturers to align the compliance date of any DOE amended or established standards as closely as possible with the refrigerant prohibition dates proposed by the December 2022 EPA NOPR. Therefore, DOE is proposing that the proposed standards, if adopted, would apply to all automatic commercial ice makers listed in Table I.1 and Table I.2 manufactured in, or

[3] Under subsection (i) of the AIM Act, entitled "Technology Transitions," the EPA may by rule restrict the use of hydrofluorocarbons (HFCs) in sectors or subsectors where they are used. A person or entity may also petition EPA to promulgate such a rule. "H.R.133 - 116th Congress (2019–2020): Consolidated Appropriations Act, 2021." Congress.gov, Library of Congress, 27 December 2020, *www.congress.gov/bill/116thcongress/house-bill/133*.

imported into, the United States on or after the date that is 3 years after the date on which the final amended standard is published.

Table I.1 Proposed Energy Conservation Standards for Batch Automatic Commercial Ice Makers

<table>
<tr><th>Equipment Type</th><th>Type of Cooling</th><th colspan="3">Harvest Rate
lb ice/24 hours</th><th>Maximum Energy Use*
kWh/100 lb ice</th><th>Maximum Condenser Water Use**
gal/100 lb ice</th></tr>
<tr><td>Ice-Making Head</td><td>Water</td><td colspan="3">>50 and <300</td><td>6.49-0.0055H</td><td>200-0.022H</td></tr>
<tr><td>Ice-Making Head</td><td>Water</td><td colspan="3">≥300 and <785</td><td>5.41-0.00191H</td><td>200-0.022H</td></tr>
<tr><td>Ice-Making Head</td><td>Water</td><td colspan="3">≥785 and <1,500</td><td>4.13-0.00028H</td><td>200-0.022H</td></tr>
<tr><td>Ice-Making Head</td><td>Water</td><td colspan="3">≥1,500 and <2,500</td><td>4</td><td>200-0.022H</td></tr>
<tr><td>Ice-Making Head</td><td>Water</td><td colspan="3">≥2,500 and <4,000</td><td>4</td><td>145</td></tr>
<tr><td>Ice-Making Head</td><td>Air</td><td colspan="3">>50 and <300</td><td>9.4 -0.01233H</td><td>NA</td></tr>
<tr><td>Ice-Making Head</td><td>Air</td><td colspan="3">≥300 and <727</td><td>6.45-0.0025H</td><td>NA</td></tr>
<tr><td>Ice-Making Head</td><td>Air</td><td colspan="3">≥727 and <1,500</td><td>5.09-0.00063H</td><td>NA</td></tr>
<tr><td>Ice-Making Head</td><td>Air</td><td colspan="3">≥1500 and <4,000</td><td>4.23</td><td>NA</td></tr>
<tr><td>Remote Condensing (but Not Remote Compressor)</td><td>Air</td><td colspan="3">>50 and <988</td><td>7.83-0.00342H</td><td>NA</td></tr>
<tr><td>Remote Condensing (but Not Remote Compressor)</td><td>Air</td><td colspan="3">≥988 and <4,000</td><td>4.45</td><td>NA</td></tr>
<tr><td>Remote Condensing and Remote Compressor</td><td>Air</td><td colspan="3">>50 and <930</td><td>7.82-0.00342H</td><td>NA</td></tr>
<tr><td>Remote Condensing and Remote Compressor</td><td>Air</td><td colspan="3">≥930 and <4,000</td><td>4.64</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Water</td><td colspan="3">>50 and <200</td><td>8.18-0.019H</td><td>191-0.0315H</td></tr>
<tr><td>Self-Contained</td><td>Water</td><td colspan="3">≥200 and <2,500</td><td>4.38</td><td>191-0.0315H</td></tr>
<tr><td>Self-Contained</td><td>Water</td><td colspan="3">≥2,500 and <4,000</td><td>4.38</td><td>112</td></tr>
<tr><td rowspan="4">Self-Contained</td><td rowspan="4">Air</td><td rowspan="4">≤50</td><td rowspan="2">Portable</td><td>≤38</td><td>19.43-0.27613H</td><td>NA</td></tr>
<tr><td>>38 and ≤50</td><td>8.94</td><td>NA</td></tr>
<tr><td colspan="2">Refrigerated Storage</td><td>29.8-0.37063H</td><td>NA</td></tr>
<tr><td colspan="2">Not Portable or Refrigerated Storage</td><td>21.08-0.19634H</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Air</td><td colspan="3">>50 and <134</td><td>13.61-0.0469H</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Air</td><td colspan="3">≥134 and <200</td><td>10.72-0.02533H</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Air</td><td colspan="3">≥200 <4,000</td><td>5.65</td><td>NA</td></tr>
</table>

* H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate.
** Water use is for the condenser only and does not include potable water used to make ice.

Table I.2 Proposed Energy Conservation Standards for Continuous Automatic Commercial Ice Makers

Equipment Type	Type of Cooling	Harvest Rate *lb ice/24 hours*		Maximum Energy Use* *kWh/100 lb ice*	Maximum Condenser Water Use** *gal/100 lb ice*
Ice-Making Head	Water	>50 and <801		6.24-0.00267H	180-0.0198H
Ice-Making Head	Water	≥801 and <1,500		4.1	180-0.0198H
Ice-Making Head	Water	≥1,500 and <2,500		4.34	180-0.0198H
Ice-Making Head	Water	≥2,500 and <4,000		4.34	130.5
Ice-Making Head	Air	>50 and <310		7.49-0.00629H	NA
Ice-Making Head	Air	≥310 and <820		6.53-0.0032H	NA
Ice-Making Head	Air	≥820 and <1,500		3.91	NA
Ice-Making Head	Air	≥1,500 and <4,000		4.67	NA
Remote Condensing (but Not Remote Compressor)	Air	>50 and <800		9.24-0.0058H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥800 and <4,000		4.6	NA
Remote Condensing and Remote Compressor	Air	>50 and <800		9.42-0.0058H	NA
Remote Condensing and Remote Compressor	Air	≥800 and <4,000		4.78	NA
Self-Contained	Water	>50 and <900		6.5-0.00302H	153-0.0252H
Self-Contained	Water	≥900 and <2,500		3.78	153-0.0252H
Self-Contained	Water	≥2,500 and <4,000		3.78	90
Self-Contained	Air	≤50	Portable	22.99-0.27789H	NA
			Not Portable	24.51-0.29623H	
Self-Contained	Air	>50 and <149		11.2-0.03H	NA
Self-Contained	Air	≥149 and <700		7.66-0.00624H	NA
Self-Contained	Air	≥700 and <4,000		3.29	NA

* H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate.
** Water use is for the condenser only and does not include potable water used to make ice.

DOE requests comments on its proposal to require that the proposed standards, if adopted, would apply to all automatic commercial ice makers listed in Table I.1 and Table I.2 manufactured in, or imported into, the United States on or after the date that is 3 years after the date on which the final amended standard is published. More generally, DOE requests comment on whether it would be beneficial to ACIM equipment manufacturers to align the compliance date of any DOE amended or established standards as closely as possible with the refrigerant prohibition dates proposed by the December 2022 EPA NOPR.

A. Benefits and Costs to Consumers

Table I.3 presents DOE's evaluation of the economic impacts of the proposed standards on consumers of automatic commercial ice makers, as measured by the average life-cycle cost (LCC) savings and the simple payback period (PBP).[4] The average LCC savings are positive for all equipment classes, and the PBP is less than the average lifetime of automatic commercial ice makers, which is estimated to be 8.5 years for high-capacity automatic commercial ice makers and 7.5 years for low-capacity ACIM equipment (B-SC-A (Portable ACIM) (≤38), B-SC-A (Refrigerated Storage ACIM), and B-SC-A (<=50). See section IV.F.7 of this document.

Table I.3 Impacts of Proposed Energy Conservation Standards on Consumers of Automatic Commercial Ice Makers

Equipment Class	Average LCC Savings* *2022$*	Simple Payback Period *years*
B-IMH-W (≥300 and <785)	0	0.0
B-IMH-W (≥785 and <1,500)	0	0.0
B-IMH-A (≥300 and <727)	22	4.4
B-IMH-A (≥727 and <1,500)	232	3.4
B-RC(NRC)-A (≥ 988 and <4,000)	37	5.2
B-SC-A (Portable ACIM) (≤38)	1	3.8
B-SC-A (Refrigerated Storage ACIM)	3	2.1
B-SC-A (<=50)	8	5.7
B-SC-A (>50 and <134)	0	0.0
B-SC-A (≥ 200 and <4,000)	21	6.0
C-IMH-W (>50 and <801)	0	0.0
C-IMH-A (≥310 and <820)	3	4.8
C-RC&RC-A (≥800 and <4,000)	162	4.2
C-SC-A (>50 and <149)	7	5.3
C-SC-A (≥149 and <700)	2	5.7

B = batch; C = continuous.
IMH = ice making head; SC = self-contained; RC = remote condensing.
W = water type of cooling; A = air type of cooling.
Number in parentheses indicates harvest rate
* The savings represent the average LCC for affected consumers.

[4] The average LCC savings refer to consumers that are affected by a standard and are measured relative to the efficiency distribution in the no-new-standards case, which depicts the market in the compliance year in the absence of new or amended standards (*see* section IV.F.10 of this document). The simple PBP, which is designed to compare specific efficiency levels, is measured relative to the baseline product (*see* section IV.C of this document).

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

B. Impact on Manufacturers[5]

The industry net present value (INPV) is the sum of the discounted cash flows to the industry from the NOPR publication year through the end of the analysis period (2023–2056). Using a real discount rate of 9.2 percent, DOE estimates that the INPV for manufacturers of automatic commercial ice makers in the case without new or amended standards is $96.4 million. Under the proposed standards, the change in INPV is estimated to range from -14.4 percent to -12.0 percent, which is approximately -$13.9 million to -$11.5 million. To bring equipment into compliance with new and amended standards, it is estimated that the industry would incur total conversion costs of $15.9 million.

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

C. National Benefits and Costs

DOE's analyses indicate that the proposed energy conservation standards for automatic commercial ice makers would save a significant amount of energy. Relative to the case without amended standards, the lifetime energy savings for automatic commercial ice makers purchased in the 30-year period that begins in the anticipated year of compliance with the amended standards (2027–2056) amount to 0.16 quadrillion

[5] All monetary values in this document are expressed in 2022 dollars.

British thermal units (Btu) or quads.[6] This represents a savings of 4 percent relative to the energy use of this equipment in the case without amended standards (referred to as the "no-new-standards case").

The cumulative net present value (NPV) of total consumer benefits of the proposed standards for automatic commercial ice makers ranges from $0.14 billion (at a 7-percent discount rate) to $0.38 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 automatic commercial ice makers purchased in 2027–2056.

In addition, the proposed standards for automatic commercial ice makers are projected to yield significant environmental benefits. DOE estimates that the proposed standards would result in cumulative emission reductions (over the same period as for energy savings) of 5 million metric tons (Mt)[7] of carbon dioxide (CO_2), 2 thousand tons of sulfur dioxide (SO_2), 8 thousand tons of nitrogen oxides (NO_X), 36 thousand tons of methane (CH_4), 0.06 thousand tons of nitrous oxide (N_2O), and 0.015 tons of mercury (Hg).[8]

DOE estimates the value of climate benefits from a reduction in greenhouse gases (GHGs) using four different estimates of the social cost of CO_2 (SC-CO_2), the social cost of methane (SC-CH_4), and the social cost of nitrous oxide (SC-N_2O). Together these

[6] The quantity refers to full-fuel-cycle (FFC) energy savings. FFC energy savings includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.*, coal, natural gas, petroleum fuels), and, thus, presents a more complete picture of the impacts of energy efficiency standards. For more information on the FFC metric, see section IV.H.1 of this document.
[7] A metric ton is equivalent to 1.1 short tons. Results for emissions other than CO_2 are presented in short tons.
[8] DOE calculated emissions reductions relative to the no-new-standards case, which reflects key assumptions in the *Annual Energy Outlook 2022* (*AEO2022*). *AEO2022* represents current Federal and state legislation and final implementation of regulations as of the time of its preparation. See section IV.K of this document for further discussion of *AEO2022* assumptions that affect air pollutant emissions.

represent the social cost of GHGs (SC-GHGs). DOE used interim SC-GHG values developed by an Interagency Working Group on the Social Cost of Greenhouse Gases (IWG).[9] The derivation of these values is discussed in section IV.L of this document. For presentation purposes, the climate benefits associated with the average SC-GHG at a 3-percent discount rate are estimated to be $0.24 billion. DOE does not have a single central SC-GHG point estimate, and DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates.

DOE estimated the monetary health benefits of SO_2 and NO_X emissions reductions using benefit per ton estimates from the scientific literature, as discussed in section IV.L of this document. DOE estimated the present value of the health benefits would be $0.24 billion using a 7-percent discount rate, and $0.56 billion using a 3-percent discount rate.[10] DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits but will continue to assess the ability to monetize other effects, such as health benefits, from reductions in direct $PM_{2.5}$ emissions.

Table I.4 summarizes the monetized benefits and costs expected to result from the proposed standards for automatic commercial ice makers. There are other important unquantified effects, including certain unquantified climate benefits, unquantified public health benefits from the reduction of toxic air pollutants and other emissions, unquantified energy security benefits, and distributional effects, among others.

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[9] To monetize the benefits of reducing GHG emissions this analysis uses the interim estimates presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990* published in February 2021 by the IWG. ("February 2021 SC-GHG TSD"*). www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.*

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

Table I.4 Summary of Monetized Benefits and Costs of Proposed Energy Conservation Standards for Automatic Commercial Ice Makers (TSL 3)

	Billion $2022
3% discount rate	
Consumer Operating Cost Savings	0.88
Climate Benefits*	0.24
Health Benefits**	0.56
Total Benefits†	1.68
Consumer Incremental Product Costs‡	0.51
Net Benefits	1.17
7% discount rate	
Consumer Operating Cost Savings	0.42
Climate Benefits* (3% discount rate)	0.24
Health Benefits**	0.24
Total Benefits†	0.89
Consumer Incremental Product Costs‡	0.28
Net Benefits	0.61

Note: This table presents the costs and benefits associated with equipment shipped in 2027−2056. These results include benefits to consumers which accrue after 2056 from the products shipped in 2027−2056.
* Climate benefits are calculated using four different estimates of the SC-CO_2, SC-CH_4, and SC-N_2O (model average at 2.5-percent, 3-percent, and 5-percent discount rates; 95th percentile at 3-percent discount rate) (*see* section IV.L of this proposed rulemaking). Together these represent the global SC-GHG. For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3-percent discount rate are shown; however, DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates. To monetize the benefits of reducing GHG emissions, this analysis uses the interim estimates presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990* published in February 2021 by the IWG.
** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. See section IV.L of this document for more details.
† Total and net benefits include those consumer, climate, and health benefits that can be quantified and monetized. For presentation purposes, total and net benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate.
‡ Costs include incremental equipment costs as well as installation costs.

The benefits and costs of the proposed standards can also be expressed in terms of annualized values. The monetary values for the total annualized net benefits are (1) the reduced consumer operating costs, minus (2) the increase in product purchase prices and installation costs, plus (3) the value of climate and health benefits of emission reductions, all annualized.[11]

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[11] To convert the time-series of costs and benefits into annualized values, DOE calculated a present value in 2022, the year used for discounting the NPV of total consumer costs and savings. For the benefits, DOE calculated a present value associated with each year's shipments in the year in which the shipments occur (*e.g.*, 2030), and then discounted the present value from each year to 2022. Using the present value, DOE

The national operating cost savings are domestic private U.S. consumer monetary savings that occur as a result of purchasing the covered equipment and are measured for the lifetime of ACIM equipment shipped in 2027–2056. The benefits associated with reduced emissions achieved as a result of the proposed standards are also calculated based on the lifetime of ACIM equipment shipped in 2027–2056. Total benefits for both the 3-percent and 7-percent cases are presented using the average GHG social costs with a 3-percent discount rate. Estimates of SC-GHG values are presented for all four discount rates in section IV.L of this document.

Table I.5 presents the total estimated monetized benefits and costs associated with the proposed standard, expressed in terms of annualized values. The results under the primary estimate are discussed in the following paragraphs.

Using a 7-percent discount rate for consumer benefits and costs and health benefits from reduced NO_x and SO_2 emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated cost of the standards proposed in this rule is $29 million per year in increased equipment costs, while the estimated annual benefits are $44 million in reduced equipment operating costs, $14 million in climate benefits, and $25 million in health benefits. In this case, the net benefit would amount to $53 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards is $29 million per year in increased equipment costs, while the estimated annual benefits are $51 million in reduced operating costs, $14 million in

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then calculated the fixed annual payment over a 30-year period, starting in the compliance year, that yields the same present value.

climate benefits, and $32 million in health benefits. In this case, the net benefit would amount to $67 million per year.

Table I.5 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Automatic Commercial Ice Makers (TSL 3)

	million 2022$/year		
	Primary Estimate	**Low-Net-Benefits Estimate**	**High-Net-Benefits Estimate**
3% discount rate			
Consumer Operating Cost Savings	51	50	52
Climate Benefits*	14	14	14
Health Benefits**	32	32	33
Total Benefits†	96	96	98
Consumer Incremental Product Costs‡	29	31	29
Net Benefits	67	64	70
7% discount rate			
Consumer Operating Cost Savings	44	43	45
Climate Benefits* (3% discount rate)	14	14	14
Health Benefits**	25	25	26
Total Benefits†	83	82	84
Consumer Incremental Product Costs‡	29	31	29
Net Benefits	53	51	55

Note: This table presents the costs and benefits associated with automatic commercial ice makers shipped in 2027−2056. These results include benefits to consumers that accrue after 2056 from the equipment shipped in 2027−2056. The Primary, Low Net Benefits, and High Net Benefits Estimates utilize projections of energy prices from the *AEO2022* Reference case, Low Economic Growth case, and High Economic Growth case, respectively. In addition, incremental equipment costs reflect a medium decline rate in the Primary Estimate, a low decline rate in the Low Net Benefits Estimate, and a high decline rate in the High Net Benefits Estimate. The methods used to derive projected price trends are explained in sections IV.F.1and IV.H.3 of this document. Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.
* Climate benefits are calculated using four different estimates of the global SC-GHG (see section IV.L of this proposed rulemaking). For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3-percent discount rate are shown; however, DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates. To monetize the benefits of reducing GHG emissions, this analysis uses the interim estimates presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990* published in February 2021 by the IWG.
** Health benefits are calculated using benefit-per-ton values for NO_X and SO_2. DOE is currently only monetizing (for SO_2 and NO_X) $PM_{2.5}$ precursor health benefits and (for NO_X) ozone precursor health benefits but will continue to assess the ability to monetize other effects such as health benefits from reductions in direct $PM_{2.5}$ emissions. See section IV.L of this document for more details.
† Total benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate.
‡ Costs include incremental equipment costs as well as installation costs.

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

D. Conclusion

DOE has tentatively concluded that the proposed energy conservation standards represent the maximum improvement in energy efficiency that is technologically feasible and economically justified and would result in the significant conservation of energy. Specifically, with regards to technological feasibility, products achieving these standard levels are already commercially available for all equipment classes covered by this proposal. As for economic justification, DOE's analysis shows that the benefits of the proposed standard exceed, to a great extent, the burdens of the proposed standards.

Using a 7-percent discount rate for consumer benefits and costs and NO_x and SO_2 reduction benefits, and a 3-percent discount rate case for GHG social costs, the estimated cost of the proposed standards for automatic commercial ice makers is $29 million per year in increased equipment costs, while the estimated annual benefits are $44 million in reduced equipment operating costs, $14 million in climate benefits, and $25 million in health benefits. The net benefit amounts to $53 million per year.

The significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[12] For example, some covered products and equipment have substantial energy consumption occur during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than products with relatively constant demand. Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis.

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

As previously mentioned, the standards are projected to result in estimated national energy savings of 0.16 quads full-fuel-cycle (FFC), the equivalent of the primary annual energy use of 4.2 million homes. In addition, they are projected to reduce CO_2 emissions by 5 Mt. Based on these findings, DOE has tentatively determined the energy savings from the proposed standard levels are "significant" within the meaning of 42 U.S.C. 6295(o)(3)(B). A more detailed discussion of the basis for these tentative conclusions is contained in the remainder of this document and the accompanying technical support document (NOPR TSD).

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

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

II. Introduction

The following section briefly discusses the statutory authority underlying this proposed rule, as well as some of the relevant historical background related to the establishment of standards for automatic commercial ice makers.

A. Authority

EPCA authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C of EPCA, added by Pub. L. 95-619, Title IV, section 441(a) (42 U.S.C. 6311–6317, as codified), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This equipment includes automatic commercial ice makers, the subject of this document. (42 U.S.C. 6311(1)(F)) EPCA prescribed initial standards for this equipment. (42 U.S.C. 6313(d)(1)) EPCA also authorizes DOE to establish new standards for automatic commercial ice makers not covered by the statutory standards. (42 U.S.C. 6313(d)(2)) Not later than January 1, 2015, with respect to the standards established under 42 U.S.C. 6313(d)(1), and, not later than 5 years after the date on which the standards take effect, with respect to the standards established under 42 U.S.C. 6313(d)(2), EPCA required DOE to issue a final rule to determine whether amending the applicable standards is technologically feasible and economically justified. (42 U.S.C. 6313(d)(3)(A)) And not later than 5 years after the effective date of any amended standards under 42 U.S.C. 6313(d)(3)(A) or the publication of a final rule determining that amending the standards is not technologically feasible or economically justified, DOE must issue a final rule to determine whether amending the standards established under 42 U.S.C. 6313(d)(1) or the amended standards, as applicable, is technologically feasible or economically justified. (42 U.S.C. 6313(d)(3)(B)) A final rule issued under 42 U.S.C. 6313(d)(2) or (3) must establish standards at the maximum level that is technologically feasible and economically justified, as provided in 42 U.S.C. 6295(o) and (p). (42 U.S.C. 6313(d)(4)) EPCA further provides that, not later than 6 years after the issuance of any final rule establishing or amending a standard, DOE must publish either a notice of determination that standards for the product do not need to be amended, or a NOPR including new proposed energy conservation standards (proceeding to a final rule, as appropriate). (42 U.S.C. 6316(a); 42 U.S.C. 6295(m)(1))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) establishment of Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA include definitions (42 U.S.C. 6311), test procedures (42 U.S.C. 6314), labeling provisions (42 U.S.C. 6315), energy conservation standards (42 U.S.C. 6313), and the authority to require information and reports from manufacturers. (42 U.S.C. 6316; 42 U.S.C. 6296)

Federal energy efficiency requirements for covered equipment established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6316(a) and (b); 42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions set forth under EPCA. (*See* 42 U.S.C. 6316(a))

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. 61316(a), 42 U.S.C. 6295(o)(3)(A), and 42 U.S.C. 6295(r)) Manufacturers of covered equipment must use the Federal test procedures as the basis for (1) certifying to DOE that their equipment complies with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6316(a); 42 U.S.C. 6295(s)), and (2) making representations about the efficiency of that equipment (42 U.S.C. 6314(d)). Similarly, DOE must use these test procedures to determine whether the equipment complies with relevant standards promulgated under EPCA. (42

U.S.C. 6316(a); 42 U.S.C. 6295(s)) The DOE test procedures for automatic commercial ice makers appear at 10 CFR 431.134.

DOE must follow specific statutory criteria for prescribing new or amended standards for covered equipment, including automatic commercial ice makers. Any new or amended standard for a covered equipment must be designed to achieve the maximum improvement in energy efficiency that the Secretary of Energy determines is technologically feasible and economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(A) and 42 U.S.C. 6295(o)(3)(B)) Furthermore, DOE may not adopt any standard that would not result in the significant conservation of energy. (42 U.S.C. 6416(a), 42 U.S.C. 6295(o)(3))

Moreover, DOE may not prescribe a standard (1) for certain equipment, including automatic commercial ice makers, if no test procedure has been established for the equipment, or (2) if DOE determines by rule that the standard is not technologically feasible or economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(3)(A)–(B)) In deciding whether a proposed standard is economically justified, DOE must determine whether the benefits of the standard exceed its burdens. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)) DOE must make this determination after receiving comments on the proposed standard, and by considering, to the greatest extent practicable, the following seven statutory factors:

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

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

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

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

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

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

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

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

(42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(I)–(VII))

Further, EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing a product or equipment 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. 6316(a); 42 U.S.C. 6295(o)(2)(B)(iii))

EPCA also contains what is known as an “anti-backsliding” provision, which prevents the Secretary from prescribing any amended standard that either increases the maximum allowable energy use or decreases the minimum required energy efficiency of a covered product. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(1)) Also, the Secretary may not prescribe an amended or new standard if interested persons have established by a preponderance of the evidence that the standard is likely to result in the unavailability in the United States in any covered equipment type (or class) of performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as those generally available in the United States. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(4))

Additionally, EPCA specifies requirements when promulgating an energy conservation standard for a covered equipment that has two or more subcategories. DOE must specify a different standard level for a type or class of equipment that has the same function or intended use, if DOE determines that equipment within such group (1) consume a different kind of energy from that consumed by other covered equipment within such type (or class), or (2) have a capacity or other performance-related feature that other equipment within such type (or class) do not have and such feature justifies a higher or lower standard. (42 U.S.C. 6316(a); 42 U.S.C. 6295(q)(1)) In determining whether a performance-related feature justifies a different standard for a group of equipment, 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. 6316(a); 42 U.S.C. 6295(q)(2))

B. Background

1. Current Standards

In a final rule published in the *Federal Register* on January 28, 2015, DOE prescribed the current energy conservation standards for automatic commercial ice makers manufactured on and after January 28, 2018 (January 2015 Final Rule). 80 FR 4645. These standards are set forth in DOE's regulations at 10 CFR 431.136(c) and (d) and are repeated in Table II.1 and Table II.2.

Table II.1 Federal Energy Conservation Standards for Batch Automatic Commercial Ice Makers

Equipment Type	**Condenser Cooling**	**Harvest Rate** ***lb ice/24 h***	**Maximum Energy Use** ***kWh/100 lb ice***	**Maximum Condenser Water Use**** ***gal/100 lb ice***
Ice-Making Head	Water	<300	6.88-0.0055H*	200-0.022H
Ice-Making Head	Water	≥300 and <850	5.80-0.00191H	200-0.022H
Ice-Making Head	Water	≥850 and <1,500	4.42-0.00028H	200-0.022H
Ice-Making Head	Water	≥1,500 and <2,500	4	200-0.022H
Ice-Making Head	Water	≥2,500 and <4,000	4	145
Ice-Making Head	Air	<300	10-0.01233H	NA
Ice-Making Head	Air	≥300 and <800	7.05-0.0025H	NA
Ice-Making Head	Air	≥800 and <1,500	5.55-0.00063H	NA
Ice-Making Head	Air	≥1500 and <4,000	4.61	NA
Remote Condensing (but Not Remote Compressor)	Air	<988	7.97-0.00342H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥988 and <4,000	4.59	NA
Remote Condensing and Remote Compressor	Air	<930	7.97-0.00342H	NA
Remote Condensing and Remote Compressor	Air	≥930 and <4,000	4.79	NA
Self-Contained	Water	<200	9.5-0.019H	191-0.0315H
Self-Contained	Water	≥200 and <2,500	5.7	191-0.0315H
Self-Contained	Water	≥2,500 and <4,000	5.7	112
Self-Contained	Air	<110	14.79-0.0469H	NA
Self-Contained	Air	≥110 and <200	12.42-0.02533H	NA
Self-Contained	Air	≥200 and <4,000	7.35	NA

* H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate. Source: 42 U.S.C. 6313(d).
** Water use is for the condenser only and does not include potable water used to make ice.

Table II.2 Federal Energy Conservation Standards for Continuous Automatic Commercial Ice Makers

Equipment Type	Condenser Cooling	Harvest Rate *lb ice/24 h*	Maximum Energy Use *kWh/100 lb ice*	Maximum Condenser Water Use *gal/100 lb ice*
Ice-Making Head	Water	<801	6.48-0.00267H	180-0.0198H
Ice-Making Head	Water	≥801 and <2,500	4.34	180-0.0198H
Ice-Making Head	Water	≥2,500 and <4,000	4.34	130.5
Ice-Making Head	Air	<310	9.19-0.00629H	NA
Ice-Making Head	Air	≥310 and <820	8.23-0.0032H	NA
Ice-Making Head	Air	≥820 and <4,000	5.61	NA
Remote Condensing (but Not Remote Compressor)	Air	<800	9.7-0.0058H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥800 and <4,000	5.06	NA
Remote Condensing and Remote Compressor	Air	<800	9.9-0.0058H	NA
Remote Condensing and Remote Compressor	Air	≥800 and <4,000	5.26	NA
Self-Contained	Water	<900	7.6-0.00302H	153-0.0252H
Self-Contained	Water	≥900 and <2,500	4.88	153-0.0252H
Self-Contained	Water	≥2,500 and <4,000	4.88	90
Self-Contained	Air	<200	14.22-0.03H	NA
Self-Contained	Air	≥200 and <700	9.47-0.00624H	NA
Self-Contained	Air	≥700 and <4,000	5.1	NA

* H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate. Source: 42 U.S.C. 6313(d).
** Water use is for the condenser only and does not include potable water used to make ice.

2. History of Standards Rulemaking for Automatic Commercial Ice Makers

On September 29, 2020, DOE published a request for information (RFI) that identified various issues on which DOE sought comment to inform its determination of whether the energy conservation standards for automatic commercial ice makers need to be amended (September 2020 RFI). 85 FR 60923.

On March 25, 2022, DOE published a notice that announced the availability of the preliminary analysis (March 2022 Preliminary Analysis) it conducted for purposes of evaluating the need for amended energy conservation standards for automatic commercial ice makers. 87 FR 17025. In the March 2022 Preliminary Analysis, DOE sought comment on the analytical framework, models, and tools that DOE used to evaluate efficiency levels for automatic commercial ice makers, the results of preliminary analyses performed, and the potential energy conservation standard levels derived from these analyses, which DOE presented in the accompanying preliminary TSD (March 2022 Preliminary TSD).[13]

On May 5, 2022, DOE held a public webinar in which it presented the methods and analysis in the March 2022 Preliminary Analysis and solicited public comment.[14]

DOE received comments in response to the March 2022 Preliminary Analysis from the interested parties listed in Table II.3.

Table II.3 List of Commenters with Written Submissions or Oral Comments in Response to the March 2022 Preliminary Analysis

Commenter(s)	Reference in this NOPR	Reference No. in the Docket	Commenter Type
Air-Conditioning, Heating, and Refrigeration Institute	AHRI	21	Trade Association
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, New York State Energy Research Development Authority, Northwest Energy Efficiency Alliance	Joint Commenters	22	Efficiency Organization
Association of Home Appliance Manufacturers*	AHAM	27	Trade Association
Follett Products LLC**	Follett	23	Manufacturer
GE Appliances, a Haier company	GEA	31	Manufacturer
Hoshizaki America, Inc.	Hoshizaki	20	Manufacturer
North American Association of Food Equipment Manufacturers	NAFEM	19	Trade Association
Pacific Gas and Electric; Southern California Edison; San Diego Gas & Electric	CA IOUs	18	Utilities
PEG, LLC	PEG	28	Consultant
Scotsman Ice Systems	Scotsman	30	Manufacturer
Welbilt, Inc.	Welbilt	25***	Manufacturer
Whirlpool Corporation	Whirlpool	26	Manufacturer

*AHAM submitted a public comment and a separate comment, which AHAM requested be treated as Confidential Business Information.
** Follett requested that its response be treated as Confidential Business Information.
*** Document number 25 is the transcript of the webinar. Commenter did not submit written comments.

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[13] 2022-03 Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Automatic Commercial Ice Makers. Available at *www.regulations.gov/document/EERE-2017-BT-STD-0022-0009*.
[14] Webinar transcript available at *www.regulations.gov/document/EERE-2017-BT-STD-0022-0025*.

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[15] To the extent that interested parties have provided written comments that are substantively consistent with any oral comments provided during the May 5, 2022, public meeting, DOE cites the written comments throughout this document. Any oral comments provided during the webinar that are not substantively addressed by written comments are summarized and cited separately throughout this document.

C. Deviation from Process Rule

In accordance with section 3(a) of 10 CFR part 430, subpart C, appendix A ("Process Rule"), DOE notes that it is deviating from the provision in the Process Rule regarding the pre-NOPR and NOPR stages for an energy conservation standards rulemaking. 10 CFR 431.4.

1. Framework Document

Section 6(a)(2) of the Process Rule states that if DOE determines it is appropriate to proceed with a rulemaking, the preliminary stages of a rulemaking to issue or amend an energy conservation standard that DOE will undertake will be a framework document and preliminary analysis, or an advance notice of proposed rulemaking. While DOE published a preliminary analysis for this rulemaking (*see* 87 FR 17025), DOE did not publish a framework document in conjunction with the preliminary analysis. DOE notes, however, that chapter 2 of the preliminary technical support document that accompanied

[15] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop energy conservation standards for automatic commercial ice makers. (Docket No. EERE-2017-BT-STD-0022, which is maintained at *www.regulations.gov*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

the preliminary analysis—entitled *Analytical Framework, Comments from Interested Parties, and DOE Responses*—describes the general analytical framework that DOE uses in evaluating and developing potential amended energy conservation standards.[16] As such, publication of a separate Framework Document would be largely redundant of previously published documents.

2. Public Comment Period

Section 6(f)(2) of the Process Rule specifies that the length of the public comment period for a NOPR will be not less than 75 calendar days. For this NOPR, DOE has opted instead to provide a 60-day comment period. DOE is opting to deviate from the 75-day comment period because stakeholders have already been afforded multiple opportunities to provide comments on this rulemaking. As noted previously, DOE requested comment on various issues pertaining to this standards rulemaking in the September 2020 RFI and provided stakeholders with a 75-day comment period. 85 FR 60923. DOE initially provided a 60-day comment period for stakeholders to provide input on the analyses presented in the March 2022 Preliminary Analysis. 87 FR 17025. DOE subsequently extended the March 2022 Preliminary Analysis comment period by 14 days. 87 FR 31964. The analytical assumptions and approaches used for the analyses conducted for this NOPR are similar to those used for the March 2022 Preliminary Analysis. Therefore, DOE believes a 60-day comment period is appropriate and will provide interested parties with a meaningful opportunity to comment on the proposed rule.

[16] The preliminary technical support document is available at *www.regulations.gov/document/EERE-2017-BT-STD-0022-0009*.

III. General Discussion

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

A. General Comments

This section summarizes general comments received from interested parties regarding rulemaking timing and process.

AHRI commented in concern over the flux in regulations and standards that apply to this industry that make technical analysis difficult and encouraged DOE to balance the holistic scope of change in the ACIM industry in the context of energy conservation, environmental conservation, environmental protection, and end-user safety. (AHRI, No. 21 at p. 6)

AHRI commented that it believes that current energy conservation standards are appropriate and more stringent standards are not necessary. (*Id*. at p. 3) AHRI does not believe it is appropriate to establish more stringent energy conservation standards based on the current efficiency level of ACIM equipment and the forecasted technology changes due to changing refrigerants, and AHRI believes the potential energy savings from a new standard would be negligible. (*Id.*)

Similarly, Hoshizaki commented that, based on the current efficiency level of ACIM equipment and forecasted technology changes due to changing refrigerants, it does not believe it is appropriate for DOE to establish energy conservation standards beyond the baseline, as the potential energy savings from a new standard are unlikely to exceed the 10 percent/0.3 quadrillion Btu threshold over baseline energy consumption needed to promulgate a rulemaking. (Hoshizaki, No. 20 at p. 2)

PEG commented that less is more when it comes to regulations and to let the competitive marketplace drive energy efficiency so that manufacturers can add value to their products by making them more efficient than competitor models. (PEG, No. 28 at p. 1)

B. Scope of Coverage

This NOPR covers the commercial equipment that meets the definition of automatic commercial ice makers. *See* 10 CFR 431.132.

"Automatic commercial ice maker" is defined as a factory-made assembly (not necessarily shipped in one package) that (1) consists of a condensing unit and ice-making section operating as an integrated unit, with means for making and harvesting ice, and (2) may include means for storing ice, dispensing ice, or storing and dispensing ice. (*Id.*)

In the March 2022 Preliminary TSD, DOE considered potential new equipment classes for automatic commercial ice makers with harvest rates less than or equal to 50 lb ice/24 hr (low-capacity automatic commercial ice makers). See chapter 3 of the March 2022 Preliminary TSD. On November 1, 2022, DOE published a final rule that amended the ACIM definitions and test procedure at 10 CFR part 431.132 and 431.134, respectively (November 2022 Test Procedure Final Rule), which included definitions (*i.e.,* portable automatic commercial ice maker and refrigerated storage automatic commercial ice maker) and test requirements for low-capacity automatic commercial ice makers. 87 FR 65856. As a result, DOE is proposing in this document to establish energy conservation standards for ice makers with capacity of 50 lb ice/24 hr or less, including portable and refrigerated storage ice makers.

"Portable automatic commercial ice maker" is defined as an automatic commercial ice maker that does not have a means to connect to a water supply line and has one or more reservoirs that are manually supplied with water. 10 CFR 431.132.

"Refrigerated storage automatic commercial ice maker" is defined as an automatic commercial ice maker that has a refrigeration system that actively refrigerates the self-contained ice storage bin. (*Id.*)

See section IV.A.1 of this document for discussion of the equipment classes analyzed in this NOPR.

C. Test Procedure

EPCA sets forth generally applicable criteria and procedures for DOE's adoption and amendment of test procedures. (42 U.S.C. 6314(a)) Manufacturers of covered equipment must use these test procedures to certify to DOE that their equipment complies with energy conservation standards and to quantify the efficiency of their equipment. DOE's current energy and condenser water conservation standards for automatic commercial ice makers are expressed in terms of the maximum allowable energy use and maximum allowable condenser water use (if applicable) as a function of the harvest rate of the given equipment. (*See* 10 CFR 431.134.)

D. 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 431.4; Section 7(b)(1) (Process Rule).

After DOE has determined that particular technology options are technologically feasible, it further evaluates each technology option in light of the following additional screening criteria: (1) practicability to manufacture, install, and service; (2) adverse impacts on product utility or availability; (3) adverse impacts on health or safety; and (4) unique pathway proprietary technologies. 10 CFR 431.4; Sections 6(b)(3)(ii)-(v) and 7(b)(2)-(5) of the Process Rule. Section IV.B of this document discusses the results of the screening analysis for automatic commercial ice makers, particularly the designs DOE considered, those it screened out, and those that are the basis for the standards considered in this rulemaking. For further details on the screening analysis for this rulemaking, see chapter 4 of the NOPR TSD.

2. Maximum Technologically Feasible Levels

When DOE proposes to adopt a new or amended standard for a type or class of covered equipment, it must determine the maximum improvement in energy efficiency or maximum reduction in energy use that is technologically feasible for such equipment. (42 U.S.C. 6316(a); 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 automatic commercial ice makers, using the design parameters for the most efficient equipment 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 document and in chapter 5 of the NOPR TSD.

E. Energy Savings

1. Determination of Savings

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

DOE used its national impact analysis (NIA) spreadsheet model to estimate national energy savings (NES) from potential amended or new standards for automatic commercial ice makers. The NIA spreadsheet model (described in section IV.H of this document) calculates energy savings in terms of site energy, which is the energy directly

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

consumed by equipment at the locations where they are used. For electricity, DOE reports national energy savings in terms of primary energy savings, which is the savings in the energy that is used to generate and transmit the site electricity. DOE also calculates NES in terms of FFC energy savings. The FFC metric includes the energy consumed in extracting, processing, and transporting primary fuels (*i.e.*, coal, natural gas, petroleum fuels), and thus presents a more complete picture of the impacts of energy conservation standards.[18] DOE's approach is based on the calculation of an FFC multiplier for each of the energy types used by covered products or equipment. For more information on FFC energy savings, see section IV.H.1 of this document.

2. Significance of Savings

To adopt any new or amended standards for a covered equipment, DOE must determine that such action would result in significant energy savings. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(3)(B))

The significance of energy savings offered by a new or amended energy conservation standard cannot be determined without knowledge of the specific circumstances surrounding a given rulemaking.[19] For example, some covered products and equipment have most of their energy consumption occur during periods of peak energy demand. The impacts of these products on the energy infrastructure can be more pronounced than products with relatively constant demand. Accordingly, DOE evaluates the significance of energy savings on a case-by-case basis, taking into account the significance of cumulative FFC national energy savings, the cumulative FFC emissions

[18] The FFC metric is discussed in DOE's statement of policy and notice of policy amendment. 76 FR 51282 (Aug. 18, 2011), as amended at 77 FR 49701 (Aug. 17, 2012).
[19] The numeric threshold for determining the significance of energy savings established in a final rule published on February 14, 2020 (85 FR 8626, 8670) was subsequently eliminated in a final rule published on December 13, 2021 (86 FR 70892).

reductions, and the need to confront the global climate crisis, among other factors. DOE has initially determined the energy savings from the proposed standard levels are "significant" within the meaning of 42 U.S.C. 6295(o)(3)(B).

F. Economic Justification

1. Specific Criteria

As noted previously, EPCA provides seven factors to be evaluated in determining whether a potential energy conservation standard is economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(I)-(VII)) The following sections discuss how DOE has addressed each of those seven factors in this proposed rulemaking.

a. Economic Impact on Manufacturers and Consumers

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

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

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

EPCA requires DOE to consider the savings in operating costs throughout the estimated average life of the covered equipment in the type (or class) compared to any increase in the price of, or in the initial charges for, or maintenance expenses of, the covered product that are likely to result from a standard. (42 U.S.C. 6316(a); 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 the equipment (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 equipment lifetime and discount rate, DOE uses a distribution of values, with probabilities attached to each value.

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

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

c. Energy Savings

Although significant conservation of energy is a separate statutory requirement for adopting an energy conservation standard, EPCA requires DOE, in determining the economic justification of a standard, to consider the total projected energy savings that are expected to result directly from the standard. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(III)) As discussed in section III.E of this document, DOE uses the NIA spreadsheet models to project national energy savings.

d. Lessening of Utility or Performance of Products

In establishing product classes and in evaluating design options and the impact of potential standard levels, DOE evaluates potential standards that would not lessen the utility or performance of the considered products. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(IV)) Based on data available to DOE, the standards proposed in this document would not reduce the utility or performance of the ACIM equipment under consideration in this proposed 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. 6316(a); 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. 6316(a); 42 U.S.C. 6295(o)(2)(B)(ii)) DOE will transmit a copy of this proposed rule to the Attorney General with a request that the Department of Justice (DOJ) provide its determination on this issue. DOE will publish and respond to the Attorney General's determination in the final rule. DOE invites comment from the public regarding the competitive impacts that are likely to result from this proposed rule. In addition, stakeholders may also provide comments separately to DOJ regarding these potential impacts. See the **ADDRESSES** section for information to send comments to DOJ.

f. Need for National Energy Conservation

DOE also considers the need for national energy and water conservation in determining whether a new or amended standard is economically justified. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(VI)) The energy savings from the proposed standards are likely to provide improvements to the security and reliability of the Nation's energy system. Reductions in the demand for electricity also may result in reduced costs for maintaining the reliability of the Nation's electricity system. DOE conducts a utility impact analysis to estimate how standards may affect the Nation's needed power generation capacity, as discussed in section IV.M of this document.

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

g. Other Factors

In determining whether an energy conservation standard is economically justified, DOE may consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(VII)) To the extent DOE identifies any relevant information regarding economic justification that does not fit into the other categories described previously, DOE could consider such information under "other factors."

2. Rebuttable Presumption

EPCA creates a rebuttable presumption that an energy conservation standard is economically justified if the additional cost to the equipment 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. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(iii)) 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 PBP 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 EPCA. (42 U.S.C. 6316(a); 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 document.

IV. Methodology and Discussion of Related Comments

This section addresses the analyses DOE has performed for this rulemaking with regard to automatic commercial ice makers. Separate subsections address each component of DOE's analyses.

DOE used several analytical tools to estimate the impact of the energy conservation standards proposed in this document. The first tool is a spreadsheet that calculates the LCC savings and PBP of potential amended or new energy conservation standards. The NIA uses a second spreadsheet set that provides shipments projections and calculates NES and NPV of total consumer costs and savings expected to result from potential energy conservation standards. DOE uses the third spreadsheet tool, the Government Regulatory Impact Model (GRIM), to assess manufacturer impacts of potential standards. These three spreadsheet tools are available on the DOE website for this rulemaking: *www.regulations.gov/docket/EERE-2017-BT-STD-0022*. Additionally, DOE used output from the latest version of the Energy Information Administration (EIA) *Annual Energy Outlook* (*AEO*), a widely known energy projection for the United States, for the emissions and utility impact analyses.

A. Market and Technology Assessment

DOE develops information in the market and technology assessment that provides an overall picture of the market for the equipment concerned, including the purpose of the equipment, the industry structure, manufacturers, market characteristics, and technologies used in the equipment. This activity includes both quantitative and qualitative assessments, based primarily on publicly available information. The subjects addressed in the market and technology assessment for this rulemaking include (1) a determination of the scope of the rulemaking and equipment classes, (2) manufacturer trade groups, (3) market share, (4) inventory, and (5) technology options that could improve the energy efficiency of automatic commercial ice makers. The key findings of DOE's market assessment are summarized in the following sections. See chapter 3 of the NOPR TSD for further discussion of the market and technology assessment.

1. Equipment Classes

When evaluating and establishing energy conservation standards, DOE may establish separate standards for a group of covered equipment (*i.e.*, establish a separate equipment class) if DOE determines that separate standards are justified based on the type of energy used, or if DOE determines that an equipment's capacity or other performance-related feature justifies a different standard. (42 U.S.C. 6316(a); 42 U.S.C. 6295(q)) In making a determination whether a performance-related feature justifies a different standard, DOE must consider such factors as the utility of the feature to the consumer and other factors DOE determines are appropriate. (*Id.*)

Automatic commercial ice makers are divided into equipment classes categorized by physical characteristics that affect commercial application, equipment utility, and equipment efficiency: (1) the ice-making process; (2) the configuration of the ice-making and refrigeration systems; (3) the type of condenser cooling fluid used; and (4) the harvest rate of the unit. The following list shows the key physical characteristics of ACIM equipment that DOE uses to distinguish equipment classes:

(1) Ice-making process: batch, continuous;

(2) Equipment configuration: ice-making head, remote condensing (but not remote compressor), remote condensing and remote compressor, self-contained;

(3) Condenser cooling fluid: air-cooled, water-cooled; and

(4) Capacity range.

DOE currently defines separate energy conservation standards for those equipment classes at 10 CFR 431.136, which are repeated in Table II.1 and Table II.2.

In response to the March 2022 Preliminary Analysis, Hoshizaki commented that it does not see any need to change any of the harvest rate ranges or combine any classes, considering that each class has its own distinctive performance and energy ranges. (Hoshizaki, No. 20 at p. 2)

DOE has tentatively determined to adjust certain capacity ranges, as presented in Table I.1 and Table I.2, based on this NOPR analysis, as a result of proposing appropriate energy use standards across the overall capacity range for a given type of equipment (*i.e.,* B-IMH-W, B-IMH-A, B-SC-A, C-SC-A). DOE reviewed the ACIM market and tentatively determined that the adjusted capacity ranges are representative of the energy use characteristics of each equipment type.

a. Low-Capacity Automatic Commercial Ice makers

DOE has tentatively determined that additional equipment classes may be appropriate to address certain automatic commercial ice makers available on the market. Specifically, DOE is proposing energy conservation standards for low-capacity automatic commercial ice makers, which are not currently subject to energy conservation standards. DOE has tentatively determined that the low-capacity automatic commercial ice makers can all be categorized under the self-contained equipment configuration and air-cooled condenser cooling fluid designation. DOE has also tentatively determined that the low capacity of these automatic commercial ice makers would require different energy conservation standards as compared to those already in place for automatic commercial ice makers with higher capacities. Additionally, DOE has tentatively determined that the unique operation of refrigerated storage and portable automatic commercial ice makers would require separate equipment classes from other self-contained, air-cooled, low-capacity automatic commercial ice makers. Based on a review of the low-capacity ACIM market, DOE tentatively determined that batch automatic commercial ice makers models represent nearly the entire market and include both portable and refrigerated storage automatic commercial ice makers. However, DOE has identified a limited number of continuous low-capacity ACIM models available on the market similar to batch automatic commercial ice makers, except that DOE found no continuous refrigerated storage automatic commercial ice makers available on the market. Accordingly, DOE is proposing energy conservation standards for the proposed low-capacity ACIM equipment classes presented in Table IV.1.

Table IV.1 Proposed Low-Capacity ACIM Equipment Classes

Process	Equipment Type	Condenser Cooling	Harvest Rate *lb ice/24 h*	Designation
Batch	Self-Contained	Air	≤50	B-SC-A (≤50)
	Portable	Air	≤38	B-SC-A (Portable ACIM) (≤38)
		Air	>38 and ≤50	B-SC-A (Portable) (>38 and ≤50)
	Refrigerated Storage	Air	≤50	B-SC-A (Refrigerated Storage ACIM)
Continuous	Self-Contained	Air	≤50	C-SC-A (≤50)
	Portable	Air	≤50	C-SC-A (Portable ACIM)

DOE received many comments in response to the March 2022 Preliminary Analysis regarding the potential equipment classes for low-capacity automatic commercial ice makers.

<u>Scope of Coverage</u>

AHAM commented that consumer stand-alone ice makers are not automatic commercial ice makers, and the term "commercial" in the ACIM category indicates an intent to cover commercial, not residential/consumer products. (AHAM, No. 27 at p. 3) AHAM added that automatic commercial ice makers are included in EPCA part A-1 for "Certain Industrial Equipment" not part A, which is for Consumer Products other than Automobiles. (*Id.*) AHAM noted that automatic commercial ice makers are "covered equipment," which is defined by EPCA as "The term 'covered equipment' means one of the following types of industrial equipment…automatic commercial ice makers." 42 U.S.C. 6311(1)(F), and therefore, automatic commercial ice makers are, by definition, industrial equipment. (*Id.*)

AHAM provided an example that commercial clothes washers are "covered equipment," and that commercial and residential clothes washers share similar construction and are often both used by individual consumers, but these equipment classes are differentiated by EPCA. (*Id.*) AHAM stated that Congress intended to include only truly commercial ice makers under the scope of the ACIM definition and

DOE should not include consumer stand-alone ice makers in the scope of this commercial equipment rulemaking. (*Id*.)

Similarly, Whirlpool stated that DOE should not include residential appliances, which are defined as "consumer products," under any energy conservation standards and test procedures in 10 CFR part 431 and added that EPCA has delineated between consumer products regulated under 10 CFR part 430, and commercial and industrial products regulated under 10 CFR part 431. (Whirlpool, No. 26 at p. 2)

AHAM and Whirlpool both commented that stand-alone ice makers that are capable of making 50 pounds of ice per day or less more squarely fit under the definition of consumer product, according to the definition found in 10 CFR 430.2. (AHAM, No. 27 at p. 3; Whirlpool, No. 26 at p. 2)

AHRI commented that DOE has already created a residential and commercial product distinction for other types of refrigeration equipment (such as distinguishing household refrigerators and freezers and commercial refrigeration equipment), and that this distinction should also apply to ice makers. (AHRI, No. 21 at p. 7)

Hoshizaki commented that low-capacity models should be given their own category and separate section to review, similar to the division between domestic and commercial refrigerators. (Hoshizaki, No. 20 at p. 2)

The CA IOUs commented that although they prefer DOE not regulate residential ice making products under the ACIM rulemaking, the energy use of ice makers in residential freezers is certainly worthy of regulation and testing. (CA IOUs, No. 18 at p. 5) The CA IOUs commented that the current DOE regulatory approach of including a universal adder for ice makers without testing the energy use of the devices may lead to a lack of improvements in ice-making efficiency. (*Id.*) The CA IOUs recommended that, in a future refrigerator/freezer rulemaking conducted under DOE's consumer product authority, DOE include ice making and dispensing in the energy test cycle. (*Id.*)

AHRI commented that residential ice makers have much different operating and market characteristics from other commercial ice makers. (AHRI, No. 21 at p. 6) AHRI also noted that commercial ice makers operate in offices and large commercial establishments and produce 50–4,000 lb of ice, and that DOE's TSD should analyze commercial equipment and maintain those products in scope. (*Id*. at pp. 6–7) AHRI commented that DOE extending the scope beyond commercial equipment makes providing feedback challenging. (*Id*. at p. 8)

Whirlpool recommended that DOE separately define "residential ice makers" and exclude them from the scope of any amended ACIM standard. (Whirlpool, No. 26 at p. 4) In the alternative, Whirlpool also recommended that DOE could make an amendment to the definition of automatic commercial ice maker that clarifies it as "any ice maker which is not a consumer product, per the definition in 10 CFR 430.2." (*Id.*)

AHAM commented that consumer ice makers should be distinguished from commercial ice makers and stated it is not appropriate under EPCA or DOE's regulations for DOE to include them in the scope of the ACIM rulemaking (including the test procedure and standards). (AHAM, No. 27 at p. 4)

AHAM stated that DOE makes its consumer/commercial product determination based on distinguishing design features or characteristics, whether the model operates in a manner that is significantly different from models of the same product type (*e.g.*, the energy use or energy-efficiency characteristics are significantly different), and the extent to which the product type can be used in a residential application. (*Id*. at pp. 3-5)

Joint Commenters supported the inclusion of low-capacity automatic commercial ice makers and evaluating potential standards for low-capacity automatic commercial ice makers, and Joint Commenters additionally supported the scope expansion in response to the December 2021 ACIM Test Procedure NOPR so that low-capacity ACIM efficiency and capacity are based on a standardized test procedure. (Joint Commenters, No. 22 at p. 1)

<u>DOE Guidance</u>

AHAM noted that DOE's prior guidance stated that "consumer products and industrial equipment are mutually exclusive categories. An appliance model can only be considered commercial under the Act if it does not fit the definition of 'consumer product'." (*Id*. at p. 3) AHAM added that DOE stated that it made this determination without regard to how the model is in fact distributed, and instead looks to whether a product is the "type" of product sold for personal use or consumption by individuals. (*Id*.) AHAM stated that it is not consistent with EPCA or DOE's own regulations to regulate residential stand-alone ice makers as commercial equipment, and DOE must not include them as automatic commercial ice makers under the energy conservation standard or the applicable test procedure. (*Id*. at p. 5)

The CA IOUs commented to note that the question of the proper division between DOE's consumer and commercial authority is not a new one, even within the refrigeration context. (CA IOUs, No. 18 at pp. 5–6) The CA IOUs commented that in 2010, DOE issued guidance in response to confusion regarding the scope of newly adopted residential refrigerator regulations. (*Id.*) The CA IOUs commented that, at that time, DOE indicated that, under 42 U.S.C. 6291(1), it would make a determination if a product is "of a type" that could be sold to consumers, specifically noting that a dorm-style refrigerator a manufacturer marketed as a "hotel mini-fridge" would still be considered a residential product. (*Id.*) The CA IOUs stated that furthermore, DOE made clear that industrial/commercial and consumer/residential products must be mutually exclusive, as the statutory definition of "industrial equipment" specifies that such equipment "is not a covered [consumer] product" under 42 U.S.C. 6291(1). Thus, the CA IOUs concluded that a product defined as residential cannot also be commercial. (*Id.*)

Miscellaneous Refrigeration Products

AHAM commented that the Appliance Standards Rulemaking Advisory Committee (ASRAC) working group for the miscellaneous refrigeration products (MREF) declined to cover consumer stand-alone ice makers as part of that rulemaking due to large differences from other products in the MREF category and low shipments of low-capacity ice makers. (AHAM, No. 27 at p. 2) AHAM added that it is confusing how DOE could attempt to cover these products as consumer products in the MREF rulemaking and then, several years later, as commercial equipment in the ACIM rulemaking. (*Id*. at p. 3)

Likewise, Whirlpool commented that it supports and echoes the AHAM positions, particularly that DOE had concluded properly in the rulemaking for MREF to not include residential ice makers under the scope of DOE's energy conservation standards. (Whirlpool, No. 26 at p. 2) Whirlpool agreed with the ways in which AHAM described the differences between residential ice makers made by manufacturers like Whirlpool, and true commercial ice makers. (*Id.*)

Whirlpool commented that DOE had previously proposed the inclusion of these residential ice makers in the MREF Conservation Standards, indicating DOE's previous belief that these residential ice makers meet the definition of a consumer product and were under evaluation for possible standards under 10 CFR part 430. (*Id*. at p. 3)

End Users

AHAM commented that low-capacity automatic commercial ice makers are primarily used in residential applications, and, even if a business chooses to purchase a residential type product, that does not mean it is a commercial product, and added that low-capacity ice makers designed for consumers are not the same as lower capacity ice makers that are designed for businesses. (AHAM, No. 27 at p. 5) AHAM additionally stated one main reason low-capacity automatic commercial ice makers do not produce as much ice as the larger commercial products is because residential applications do not require the same amount of ice as commercial applications that must produce ice on a daily basis and throughout the day, as opposed to on an intermittent basis, likely not even daily for low-capacity automatic commercial ice makers. (*Id*.)

Similarly, Whirlpool commented that there are key differences between residential and commercial icemakers: the end-purchasers of the products, the usage of the products, and the design of the products. (Whirlpool, No. 26 at p. 3) Whirlpool commented that the end-purchasers of residential ice makers are consumers, whereas ice makers are purchased by businesses and business owners. (*Id.*)

Scotsman commented that ice makers with production capacities under 50 pounds per day should not be considered for inclusion in the automatic commercial ice machine category. (Scotsman, No. 30 at p. 2) Scotsman added that the application for low production ice makers is for residential, in-the-home installations, and those icemakers not designed or intended to support commercial foodservice, commercial business or retail operations. (*Id*. at pp. 2-3)

Portable Automatic Commercial Ice Makers

AHAM commented that portable ice makers are designed to fit on the countertop and are not plumbed into the water supply but rely on a reservoir, and are designed this way because they are meant to go in residential spaces or to be moved from space-to-space within a residence and are not intended to support a business. (AHAM, No. 27 at p. 4) AHAM added that a refillable reservoir is not a design feature that a commercial application would find practical or efficient because it would require constant re-filling throughout the day, particularly for the volume of ice required by the commercial user, whereas residential consumers, who use far less ice, are not bothered by the need to fill the reservoir. (*Id.*) AHAM commented that portable automatic commercial ice makers are designed for a residential application and designed to be able to move from room to room, avoiding the need for a complex, expensive installation because they are not plumbed into a water line. (*Id*. at p. 5) AHAM added that portable automatic commercial ice makers must be compact in size, light enough to move, and contain a water reservoir. (*Id*.) AHAM stated that the portable automatic commercial ice makers only allow small amounts of ice storage before turning the unit off. (*Id*.) AHAM added that portable automatic commercial ice makers are distinct from all other products DOE is considering under the scope of this proposed rulemaking. (*Id*. at pp. 5–6) AHAM concluded that it is more likely that residential consumers are purchasing a portable ice maker specifically for its portability and less complex and costly installation with the intent of using it only occasionally; thus these design differences make sense. (*Id*. at p. 4)

Safety Standards

In addition, AHAM commented there are different applicable safety standard requirements for consumer and commercial stand-alone ice-makers, but stated that commercial icemakers are covered by UL 60335-2-89, "Particular Requirements for Commercial Refrigerating Appliances and Ice-Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor," whereas residential ice makers are covered by UL 60335-2-24, "Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances, and Ice Makers." (*Id*. at. 6)

Sanitary Guidelines

AHAM commented that stand-alone ice makers designed for residential use do not need to meet commercial kitchen safety and sanitary guidelines (NSF certification/listing), which essentially prohibits the installation of residential ice makers in commercial spaces (*e.g.,* mopping the floor with certain chemicals in a commercial kitchen could damage a residential ice maker, whereas commercial ice makers are designed to be higher off the ground so that critical components are shielded from liquid intrusions). (*Id*. at p. 6)

Durability Requirements

AHAM stated that consumer stand-alone ice makers do not need to meet the same durability requirements of commercial ice makers because they are used less frequently. (*Id*. at p. 6)

Warranties

AHAM stated also that consumer stand-alone ice maker warranties may only be valid if the product is used in a residential application, adding that many warranties are void if used in a commercial kitchen. (*Id*. at p. 6)

Space Constraints

AHAM commented that undercounter ice makers are constrained by space (countertop height and cabinet depth), whereas commercial ice makers can be larger in height and depth. (*Id*. at p. 4) AHAM added that residential ice makers are designed this way because they are designed to fit in residential kitchens and other residential spaces, not in commercial spaces. (*Id*.)

GEA stated that there are significant and definite differences between residential and commercial ice makers, and those differences are reflected in GEA's residential ice makers. (GEA, No. 31 at p. 2) GEA's residential ice makers are space constrained, certified to different UL standards than commercial ice makers, sold through traditional residential sales channels, and their warranties limit use of the products to residential applications. (*Id.*) GEA's portable icemakers are designed to fit on a standard residential depth counter. (*Id.*)

Whirlpool agreed that residential ice makers are typically designed for undercounter installation or countertop placement, whereas commercial ice makers can be designed for a number of different commercial installation locations, not limited to undercounter or countertop placement. (Whirlpool, No. 26 at p. 3)

Ice Quality

AHAM commented that low-capacity ice makers make clear, cubed ice, and some make nugget ice depending on consumer choice, while commercial ice makers are designed for larger capacity and higher production rates with less focus on the quality or type of ice. (AHAM, No. 27 at p. 4)

Utilization Factor

GEA agreed with AHAM's comments that there are significant and definite differences between residential and commercial ice makers and noted that those differences are reflected in GEA's residential ice makers. (GEA, No. 31 at p. 2). GEA recommended that the intermittent usage for residential ice makers should be taken into account for the standards for these products and is yet a further reason why regulations for commercial equipment should not apply to residential products. (*Id.*)

Equipment Classes

AHAM stated that it opposes DOE's decision to include the low-capacity equipment classes (harvest rates 50 lb or less per day) to the extent that they include consumer/residential ice makers. (AHAM, No. 27 at p. 2) AHAM added that doing so conflicts with EPCA's distinction between consumer and commercial equipment and DOE's guidance on the distinction between consumer and commercial equipment. (*Id.*, p. 2)

AHRI commented that adding the proposed low-capacity ACIM equipment classes may not be appropriate, and AHRI does not believe it is helpful to categorize these types of ice makers in the same energy conservation standard as automatic commercial ice makers. (AHRI, No. 21 at p. 2)

The CA IOUs commented that DOE should perform a more in-depth evaluation of ice machines rated at/under 50 lb/day to further support the development of these new ACIM product classes. (CA IOUs, No. 18 at p. 1)

Testing

AHRI added that there is a lack of laboratory capacity due to a backlog caused by the COVID-19 pandemic, lack of an appropriately verified standard (ASHRAE 29), and a lack of expertise in testing low-capacity equipment. (AHRI, No 21 at p. 2) Hoshizaki commented that there are no known tests for low-capacity models. (Hoshizaki, No. 20 at p. 2) NAFEM commented that ASHRAE Standard 29-2009 provides for the testing of equipment with capacities from 50 to 4,000 lb/24 h, and, as it is unclear what test procedure would work for the low-capacity models, that further analysis and explanation of these must be made so that the applicability of the proposed test procedure can be evaluated. (NAFEM, No. 19 at p. 2)

Examples of Low-Capacity Automatic Commercial Ice Makers

Both AHRI and Hoshizaki commented to request examples of actual models on the market for "Proposed Low-Capacity Automatic Commercial Ice Maker Equipment Classes" B-SC-A Portable ACIM, B-SC-A Refrigerated Storage ACIM, and B-SC-A from Tables ES.2.37 and 3.2.2. (AHRI, No. 21 at p. 11; Hoshizaki, No. 20 at p. 5)

NAFEM commented that it requests that DOE provide examples of existing models available in the marketplace that DOE has determined would fall into the two new proposed categories, as it is important for other information in the March 2022 Preliminary TSD, such as test procedures and shipments. (NAFEM, No. 19 at p. 2)

DOE's Response

In response to these comments, DOE notes that, although DOE's current energy and condenser water use standards are limited explicitly to automatic commercial ice makers with capacities between 50 and 4,000 lb/24 h (*see* 10 CFR 431.136), the regulatory and statutory definitions of automatic commercial ice maker are not limited by harvest rate (*i.e.*, capacity). (*See* 10 CFR 431.132 and 42 U.S.C. 6311(19), respectively.) DOE has noted, and commenters have confirmed,[20] that ice makers with harvest rates less than or equal to 50 lb/24 h (*i.e.,* low-capacity automatic commercial ice makers) are available in the market and are used in a variety of settings.

EPCA defines "covered equipment" to include certain types of "industrial equipment," including automatic commercial ice makers. (42 U.S.C. 6311(1)) EPCA defines "industrial equipment" to mean any article of equipment referred to in subparagraph (B)[21] of a type, including the ACIM type, (1) which in operation consumes, or is designed to consume, energy; (2) which, to any significant extent, is distributed in commerce for industrial or commercial use; and (3) which is not a "covered product" as defined in 42 U.S.C. 6291(a)(2), other than a component of a covered product with respect to which there is in effect a determination under 42 U.S.C. 6312(c); and this is without regard to whether such an article is in fact distributed in commerce for industrial or commercial use. (42 U.S.C. 6311(2))

As discussed, the regulatory and statutory definitions of automatic commercial ice makers are not limited by harvest rate (*see* 10 CFR 431.132 and 42 U.S.C. 6311(19), respectively) and automatic commercial ice makers are not a covered product as defined in 42 U.S.C. 6291–6292. And in the November 2022 Test Procedure Final Rule, DOE

[20] See Joint Commenters, No. 22 at p. 1 and *www.regulations.gov/document/EERE-2017-BT-TP-0006-0014* at p. 8.

[21] Subparagraph (B) of 42 U.S.C. 6311(2) identifies the types of equipment under consideration and includes automatic commercial ice makers.

determined that low-capacity ACIMs are distributed in commerce for commercial use. 87 FR 65856, 65681. Therefore, in this NOPR, DOE has tentatively determined that low-capacity automatic commercial ice makers are, to a significant extent, distributed in commerce for commercial use. DOE has reviewed the low-capacity ACIM market and found that manufacturers specifically market certain low-capacity automatic commercial ice makers for commercial use and/or using commercial air and water ambient rating conditions (*i.e.*, 90 °F air temperature and 70 °F water temperature, which are the same air and water ambient rating conditions used in DOE's test procedures for automatic commercial ice makers currently prescribed at 10 CFR 431.134),[22] and distributors sell low-capacity automatic commercial ice makers for commercial use, including automatic commercial ice makers from the proposed low-capacity ACIM equipment classes.[23] As such, notwithstanding that low-capacity automatic commercial ice makers may also be distributed in commerce for personal use or consumption by individuals, low-capacity automatic commercial ice makers meet the definition of "industrial equipment" and therefore are covered under the EPCA definition of "covered equipment."

DOE had previously considered test procedures for low-capacity automatic commercial ice makers in a test procedures NOPR for MREFs. 79 FR 74894 (Dec. 16, 2014). During the December 2014 MREF Test Procedure NOPR public meeting, True Manufacturing commented that there are very few differences between ice makers with

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[22] See *www.scotsman-ice.com/service/Specs%20Sheets/2017/SIS-SS-CU0415_0117%20LR.pdf; www.hoshizaki.com/docs/color-specs/AM-50BAJ-(AD)DS.pdf; www.hoshizaki.com/docs/color-specs/IM-50BAA-Q.pdf; www.hoshizaki.com/docs/color-specs/C-80BAJ-(AD)DS.pdf; www.manitowocice.com/asset/?id=qsoqru&regions=us&prefLang=en; www.scotsman-ice.com/service/Specs%20Sheets/2018/SIS-SS-CU-CU50_0118%20LR.pdf;iom-stage.azurewebsites.net/getattachment/b06fdb7c-aaaa-4e5b-b5a6-b091e657a0d3/UCG060A-Spec-Sheet; and www.summitappliance.com/catalog/model/BIM44GCSS.*

[23] See *www.katom.com/cat/countertop-ice-makers.html?brand=Danby; www.katom.com/cat/undercounter-ice-makers.html?suggested_use=Commercial&production_range_lb%2Fday=1%20-%2099%20lbs; www.ckitchen.com/313767/ice-machine-with-bin.html?filter=type-of-cooling:air-cooled;4-hr-production:10-50lbs; www.webstaurantstore.com/13283/undercounter-ice-machines.html?filter=24-hour-ice-yield:38~102-pounds;* and *www.staples.com/ice+maker/directory_ice%2520maker.*

harvest rates less than 50 lb/24 h and those with harvest rates greater than 50 lb/24 h. (Public Meeting Transcript, No. EERE-2013-BT-TP-0029-0014 at p. 31) In a supplemental notice of proposed determination regarding MREF coverage, DOE noted that a working group established to consider test procedures and standards for MREFs made two observations: (1) ice makers are fundamentally different from the other product categories considered as MREFs; and (2) ice makers are covered as commercial equipment and there is no clear differentiation between consumer and commercial ice makers. 81 FR 11454, 11456 (Mar. 4, 2016). In a 2016 final notice of proposed determination, DOE determined that ice makers were significantly different from the other product categories considered, and ice makers were not included in the scope of coverage or test procedure for MREFs. 81 FR 46767, 46773 (July 18, 2016).

To this end, DOE is proposing to establish equipment classes for specific low-capacity ACIM categories because they have different capacity, unique consumer utility features, and different inherent energy use than other categories of automatic commercial ice makers.

DOE is also proposing to establish energy conservation standards for low-capacity automatic commercial ice makers. DOE has tentatively determined that all low-capacity automatic commercial ice makers are self-contained and have air-cooled condensers. DOE has also tentatively determined that the low-capacity of these automatic commercial ice makers would require different energy conservation standards as compared to those already in place for automatic commercial ice makers with higher capacities. Additionally, DOE has initially determined that the unique operation of refrigerated storage and portable automatic commercial ice makers would require separate equipment classes from other self-contained, air-cooled low-capacity automatic commercial ice makers.

Based on a review of the low-capacity ACIM market, DOE observed that both batch and continuous designs are available in the market, although DOE found no evidence of continuous refrigerated storage automatic commercial ice makers.

DOE requests comments on its proposal to establish equipment classes and energy conservation standards for low-capacity ACIM categories.

Refrigerated Storage Automatic Commercial Ice Makers

Typical self-contained automatic commercial ice makers have an ice storage bin that is insulated but provides no active refrigeration. As a result, the ice melts slowly to balance the bin's thermal load, and the ice maker must periodically replenish the melted ice. Conversely, some self-contained low-capacity automatic commercial ice makers feature a refrigerated storage bin that prevents melting of the stored ice. Because of the different refrigeration system components, automatic commercial ice makers with a refrigerated storage bin (*i.e.*, refrigerated storage automatic commercial ice makers) have different energy use characteristics than automatic commercial ice makers without refrigerated storage. An example of a refrigerated storage automatic commercial ice maker is the Whynter UIM-155.[24]

In response to the March 2022 Preliminary Analysis, the CA IOUs recommended that DOE clarify the distinction between the refrigerated storage product class and residential freezers with built-in icemakers. (CA IOUs, No. 18 at p. 3) The CA IOUs

[24] See *www.whynter.com/product/uim-155/.*

commented that the new refrigerated storage class uses the same design for the ice freezing mechanism as residential freezers, and it has similar production capacities (*i.e.,* 3–6 lb/day). (*Id*. at p. 4) The CA IOUs recommended that DOE should provide a more precise definition to avoid unintentionally bringing within the scope of the ACIM rulemaking any residential freezers currently regulated by DOE under 10 CFR 430.32(a). (*Id.*) The CA IOUs also suggested that DOE consider including in the definition of refrigerated storage automatic commercial ice makers that these units do not provide any interior or door shelving storage (*i.e.,* they store only ice as the ice bin fills most of the interior volume). (*Id*. at p. 5)

The definition of "Freezer" at 10 CFR 430.2 includes a provision that excludes "any refrigerated cabinet that consists solely of an automatic ice maker and an ice storage bin arranged so that operation of the automatic icemaker fills the bin to its capacity."

Based on comments received in response to the March 2022 Preliminary Analysis, DOE is proposing to amend the definition to better differentiate refrigerated storage automatic commercial ice makers from freezers as follows:

"Refrigerated storage automatic commercial ice maker" means an automatic commercial ice maker that has a refrigeration system that actively refrigerates the self-contained ice storage bin and for which there is no internal storage space other than the ice storage bin that holds the produced ice.

DOE requests comments on its proposal to amend the definition of refrigerated storage automatic commercial ice maker.

2. Manufacturer Trade Groups

Whirlpool commented that the March 2022 Preliminary Analysis TSD did not appear to include analysis of residential ice makers. Specifically, Whirlpool noted that AHAM was not listed as an impacted manufacturer trade group, nor were Whirlpool or other residential ice maker manufacturers listed as potentially-impacted manufacturers in chapter 3 of the March 2022 Preliminary TSD. (Whirlpool, No. 26 at p. 3) AHAM suggested that the MIA should include manufacturers of residential products, and that DOE should include these manufacturers in its manufacturer interviews. (AHAM, No. 27 at p. 8)

For this NOPR, DOE updated its assessment of manufacturer trade groups to include AHAM and its list of low-capacity ACIM equipment original equipment manufacturers (OEMs) to include Whirlpool and other relevant manufacturers. To identify additional OEMs of low-capacity automatic commercial ice makers, DOE expanded the database used for the March 2022 Preliminary Analysis with publicly available data aggregated from web scraping retail websites. DOE reviewed this database and identified fifteen OEMs of low-capacity automatic commercial ice makers. See chapter 3 of the NOPR TSD for a list of OEMs by equipment category. In support of this NOPR, DOE's contractors reached out to a range of manufacturers and interviewed manufacturers specializing in both covered automatic commercial ice makers and low-capacity automatic commercial ice makers.

3. Market Share

AHRI commented that it does not appear that DOE performed its analysis of market share in Table 9.3.3 that aligns with the market participants in section 3.2.3.2, and that, as a result, AHRI cannot corroborate or refute the market share information because of the different scopes of equipment. (AHRI, No. 21 at p. 8)

DOE acknowledges that the analysis of "major" industry participants in section 3.2.3.2 of the March 2022 Preliminary TSD chapter 3 did not encompass low-capacity automatic commercial ice makers as it was based on model listings in DOE's Compliance Certification Database (CCD). For the NOPR, DOE conducted a more comprehensive review of available low-capacity automatic commercial ice makers using publicly available data (*e.g.*, data aggregated from web scraping retail websites) to estimate low-capacity manufacturer model counts. Furthermore, DOE asked manufacturers in confidential interviews about the ACIM equipment manufacturer landscape. See chapter 3 of the NOPR TSD for an updated review of manufacturers offering covered equipment and/or low-capacity ice makers.

4. Inventory

AHRI commented that Table 3.2.11 should be updated to show 2021 and 2022 inventory at an all-time low to improve the accuracy of the analysis compared to data based on 2019 levels. (AHRI, No. 21 at p. 2)

In the March 2022 Preliminary TSD, Table 3.2.11 showed the end-of-year inventory[25] for North American Industry Classification System (NAICS) code 333415 from 2010—2019, according to the U.S. Census Bureau's *Annual Survey of*

[25] According to *ASM,* survey respondents report inventories owned by their establishment, "at cost or market as of December 31 of the survey year using generally accepted accounting practices but before any valuation method adjustments." This would include finished goods, work-in-process, and materials, supplies, fuels, etc. Definitions and instructions for the *ASM* can be found online at *www2.census.gov/programs-surveys/asm/technical-documentation/questionnaire/2021/instructions/MA_10000_Instructions.pdf* (Accessed January 16, 2023).

Manufactures (*ASM*).[26] While the *ASM's* reported end-of-year inventory is not an explicit input to DOE's analysis of potential amended standards, DOE appreciates the comment and has updated the relevant data to include the most up-to-date information from *ASM.* See chapter 3 of the NOPR TSD for additional details.

5. Technology Options

In the preliminary market analysis and technology assessment, DOE identified 20 technology options that would be expected to improve the efficiency of automatic commercial ice makers, as measured by the DOE test procedure and shown in Table IV.2.

Table IV.2 Technology Options for Automatic Commercial Ice Makers in the March 2022 Preliminary TSD

Technology Options		Batch Ice Makers	Continuous Ice Makers	Notes
Compressor	Improved compressor efficiency	X	X	
	Alternative Refrigerants	X	X	
	Part load operation	X	X	
Condenser	Increased surface area	X	X	
	Enhanced fin surfaces	X	X	Air-cooled only
	Increased air flow	X	X	Air-cooled only
	Increased water flow	X	X	Water-cooled only
	Brazed plate condenser	X	X	Water-cooled only
	Microchannel condenser	X	X	Air-cooled only
Fans and Motors	Higher efficiency condenser fans and fan motors	X	X	Air-cooled only
	Improved auger motor efficiency		X	
	Improved pump motor efficiency	X		
Evaporator	Design options that reduce energy loss due to evaporator thermal cycling	X		
	Design options that reduce harvest meltage or reduce harvest time	X		
	Larger evaporator surface area	X	X	

[26] U.S. Census Bureau. *Annual Survey of Manufactures*. (2013–2021). Available at *www.census.gov/programs-surveys/asm.html* (last accessed February 1, 2023).

Technology Options		Batch Ice Makers	Continuous Ice Makers	Notes
Insulation	Improved insulating material and/or thicker insulation around the evaporator compartment or sump	X	X	
Refrigeration Line	Larger diameter suction line	X	X	Remote condensing units with remote compressor only
Potable Water	Reduced potable water flow	X		
	Drain water thermal exchange	X		
Expansion Valves	Higher Efficiency Expansion Valves	X	X	

DOE received several comments in response to the March 2022 Preliminary Analysis regarding the technology assessment.

a. Compressors

The CA IOUs commented that compressor energy efficiency ratios (EERs) and the make and model of the compressor are not listed in ice maker manufacturers' spec sheets, and that manufacturers test compressors according to AHRI 540, but there is no public database. (CA IOUs, No. 18 at p. 8). The CA IOUs commented that providing a range of EERs for compressors of all sizes will show the potential energy savings of different compressor options. (*Id.*)

AHAM added that efficiency is largely driven by the compressor, but not all compressors can be approved for hot gas bypass, which is the typical harvest approach for batch automatic commercial ice makers. (AHAM, No. 27 at p. 12) AHAM noted this means there are compressors specific to this application and the market is not large enough for compressor manufacturers to make new compressors periodically to improve efficiency, and that if DOE were to promulgate standards, compressor availability would be a significant concern. (*Id.*)

DOE considered the range of EERs for compressor sizes available for batch and continuous automatic commercial ice makers at each of the representative harvest rates. See chapter 5 of the NOPR TSD for additional details.

Alternative Refrigerants

AHAM commented that DOE's analysis includes alternative refrigerants as possible options, and AHRI noted that not all types of alternative refrigerants are viable options for ice makers. (*Id*. at p. 12) AHAM further noted that use of alternative refrigerants may further limit the space available to include a more efficient compressor. (*Id.*). AHAM added that even if the EPA approves alternative refrigerant for ice makers, it may not necessarily be a viable design option, as ice makers use a flooded evaporator and that limits refrigerant types. (*Id.*)

AHRI commented that many of the A2L refrigerants have a high temperature glide, which negatively impacts performance and energy consumption, and that as a result, the ability of the ACIM industry to respond and deliver products with A2L or natural refrigerants is constrained. (AHRI, No. 21 at p. 5)

The EPA proposed refrigerant restrictions pursuant to the AIM Act[27] affecting automatic commercial ice makers in the December 2022 EPA NOPR. 87 FR 76738. Specifically, EPA proposed prohibitions for three categories of automatic commercial ice machines (EPA's term for this equipment): (1) stand-alone, with refrigerant charge capacities of 500 grams or lower, when using or intended to use a regulated substance or

[27] Under subsection (i) of the AIM Act, entitled "Technology Transitions," the EPA may by rule restrict the use of HFCs in sectors or subsectors where they are used. A person or entity may also petition EPA to promulgate such a rule. "H.R.133 - 116th Congress (2019–2020): Consolidated Appropriations Act, 2021." Congress.gov, Library of Congress, 27 December 2020, *www.congress.gov/bill/116thcongress/house-bill/133*.

a blend containing a regulated substance with a global warming potential (GWP) of 150 or greater; (2) stand-alone, with refrigerant charge capacities of more than 500 grams, when using or intended to use any of the following: R-404A, R-507, R-507A, R-428A, R-422C, R-434A, R-421B, R-408A, R-422A, R-407B, R-402A, R-422D, R-421A, R-125/R-290/R-134a/R-600a (55/1/42.5/1.5), R-422B, R-424A, R-402B, GHG-X5, R-417A, R-438A, R-410B, R-407A, R-410A, R-442A, R-417C, R-407F, R-437A, R-407C, RS-24 (2004 formulation), and HFC-134a; and (3) remote, when using or intended to use any of the following: R-404A, R-507, R-507A, R-428A, R-422C, R-434A, R-421B, R-408A, R-422A, R-407B, R-402A, R-422D, R-421A, R-125/R-290/R-134a/R-600a (55/1/42.5/1.5), R-422B, R-424A, R-402B, GHG-X5, R-417A, R-438A, and R-410B. *Id.* at 87 FR 76810–76811. The proposal would prohibit manufacture or import of such ice makers starting January 1, 2025, and would ban sale, distribution, purchase, receive, or export of such ice makers starting January 1, 2026. *Id.* at 87 FR 76809. DOE considered the use of alternative refrigerants that are not prohibited for automatic commercial ice makers in the December 2022 EPA NOPR. See section IV.C.1.a and chapter 5 of the NOPR TSD for additional details.

b. Microchannel Condensers

The CA IOUs commented that they recommend that DOE consider the impacts of microchannel condensers on refrigerant charge, because microchannel condensers allow for the reduction of the refrigerant charge compared to standard tube-and-fin condensers. (CA IOUs, No. 18 at p. 7) The CA IOUs commented that using microchannel condensers with R-290 refrigerant will allow larger machines to use this refrigerant and reduce their energy usage without requiring an increased charge limit. (*Id.*)

DOE considered the use of microchannel condensers on ACIM performance. See section IV.C.1.b and chapter 5 of the NOPR TSD for additional details.

DOE is retaining the technology options from the March 2022 Preliminary TSD for this NOPR. See chapter 3 of the NOPR TSD for additional details.

B. Screening Analysis

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

(1) *Technological feasibility.* Technologies that are not incorporated in commercial products or in commercially viable, existing 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 projected compliance date of the standard, then that technology will not be considered further.

(3) *Impacts on product utility.* If a technology is determined to have a significant adverse impact on the utility of the product to 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 United States at the time, it will not be considered further.

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

(5) *Unique-pathway proprietary technologies*. If a technology has proprietary protection and represents a unique pathway to achieving a given efficiency level, it will not be considered further, due to the potential for monopolistic concerns.

10 CFR 431.4; 10 CFR part 430, subpart C, appendix A, sections 6(c)(3) and 7(b).

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

The subsequent sections include 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.

DOE did not receive any comments in response to the March 2022 Preliminary Analysis specific to the screening analysis.

1. Screened-Out Technologies

DOE is retaining the screened-out technologies from the March 2022 Preliminary TSD for this NOPR (Table IV.3).

Table IV.3 Screened Out Technology Options

Technology Option	EPCA Criterion (X = basis for screening out)				
	Technological Feasibility	Practicability to Manufacture, Install, and Service	Adverse Impacts on Utility or Availability	Adverse Impacts on Health and Safety	Unique-Pathway Proprietary Technologies
Increased Condenser Air Flow	X		X		
Reduced Energy Loss Due to Evaporator Thermal Cycling					X
Larger Diameter Remote Suction Line			X		
Reduced Potable Water Use (<20 gal/100 lb ice)			X		

a. Increased Condenser Air Flow

Increased condenser air flow results in increased heat transfer and a reduced condensing temperature, which results in lower compressor power. However, increased air flow requires increased fan input power, offsetting some (or all) of the compressor power reduction. DOE expects that condenser fan motors in automatic commercial ice makers are generally sized to optimize performance of the refrigeration system, and improved efficiency due to increased air flow may not be technically feasible.

Additionally, increased fan sizes to allow for higher air flow rates generally require more space for the fan motor and fan assembly. DOE has observed that ACIM designs use the entirety of available cabinet space, and therefore any additional component size increases would likely require larger cabinet geometries. Because automatic commercial ice makers are typically used in locations prioritizing smaller equipment footprints (*e.g.*, commercial kitchens), larger cabinet sizes may adversely impact the availability of equipment with current sizes at a given harvest rate.

b. Reduced Energy Loss Due to Evaporator Thermal Cycling

During the rulemaking analysis for the January 2015 Final Rule (80 FR 4646), DOE determined that one technology used by commercially available ice makers to reduce thermal mass is proprietary. 80 FR 4646, 4674. The evaporators used by Hoshizaki America, Inc. contain proprietary elements that would make it difficult for others to replicate the design. Hence, DOE screened out this option because of its proprietary status. See chapter 4 of the January 2015 Final Rule TSD.[28] DOE has tentatively determined that the reduced thermal mass evaporator designs continue to contain proprietary elements, and therefore has continued to screen this technology option from further consideration in this NOPR.

c. Larger Diameter Remote Suction Line

Increasing the suction line diameter could be considered to reduce suction line pressure drop for remote condenser equipment with remote compressors. However, the reduced suction vapor velocity associated with the approach could degrade oil return effectiveness. Remote ice maker line sets can be installed in the field so that suction line refrigerant runs up, down, or horizontally to the compressor; hence, they are conservatively sized to provide adequate oil return for a wide range of installation conditions. DOE has not considered an increase in suction line size because of reliability concerns associated with potential oil hold-up and compressor failure associated with larger-diameter line sets.

d. Reduced Potable Water Use (<20 gal/100 lb ice)

One purpose of water drained from batch ice makers is to remove dissolved solids that enter with the potable water supply. Selecting excessively low potable water levels

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[28] Available at *www.regulations.gov/docket/EERE-2010-BT-STD-0037*.

can lead to insufficient removal of dissolved solids, resulting in increased maintenance costs associated with an increased need for descaling operations, and, after the ice maker has operated for a number of cycles, the scale build-up can reduce ice production and increase energy use. Additionally, insufficient drain water may adversely impact ice quality.

In the January 2015 Final Rule analysis, DOE considered decreases in potable water flow down to 20 gal/100 lb ice to ensure proper drainage of particulates from the sump, based on feedback from stakeholders. See chapter 5 of the January 2015 Final Rule analysis.[29] To ensure appropriate automatic commercial ice maker operation, DOE has screened out reductions in potable water use to levels below 20 gal/100 lb ice produced for batch ice makers.

2. Remaining Technologies

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

[29] Available at *www.regulations.gov/docket/EERE-2010-BT-STD-0037*.

Table IV.4 Retained Design Options

Technology Options		Batch Ice Makers	Continuous Ice Makers	Notes
Compressor	Improved compressor efficiency	X	X	
	Alternative refrigerants	X	X	
	Part load operation	X	X	
Condenser	Increased surface area	X	X	
	Enhanced fin surfaces	X	X	Air-cooled only
	Brazed plate condenser	X	X	Water-cooled only
	Microchannel condenser	X	X	Air-cooled only
Fans and Motors	Higher efficiency condenser fans and fan motors	X	X	Air-cooled only
	Improved auger motor efficiency		X	
	Improved pump motor efficiency	X		
Evaporator	Design options that reduce harvest meltage or reduce harvest time	X		
	Larger evaporator surface area	X	X	
Insulation	Improved insulating material and/or thicker insulation around the evaporator compartment or sump	X	X	
Potable Water	Reduced potable water flow (as low as 20 gal/100 lb ice)	X		
	Drain water thermal exchange	X		
Expansion Valves	Higher efficiency expansion valves	X	X	

DOE has initially determined that these technology options are technologically feasible because they are being used or have previously been used in commercially-available equipment 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, unique-pathway proprietary technologies). For additional details, see chapter 4 of the NOPR TSD.

C. Engineering Analysis

The purpose of the engineering analysis is to establish the relationship between the efficiency and cost of automatic commercial ice makers. There are two elements to consider in the engineering analysis; the selection of efficiency levels (ELs) to analyze (*i.e.*, the efficiency analysis) and the determination of equipment cost at each efficiency level (*i.e.*, the cost analysis). In determining the performance of higher-efficiency equipment, DOE considers technologies and design option combinations not eliminated by the screening analysis. For each equipment class, DOE estimates the baseline cost, as well as the incremental cost for the equipment at efficiency levels above the baseline. The output of the engineering analysis is a set of cost-efficiency "curves" that are used in downstream analyses (*i.e.*, the LCC and PBP analyses and the NIA).

1. Efficiency Analysis

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

In this rulemaking, DOE relies on a design-option approach, supported with reverse engineering multiple analysis units. DOE generally relied on test data and reverse engineering to inform a range of design options used to reduce energy use. The design options were incrementally added to the baseline configuration and continued through the "max-tech" configuration (*i.e.*, implementing the "best available" combination of available design options).

DOE directly analyzed fifteen equipment classes, ten batch type and five continuous type, and has selected representative units for analysis in these classes. These equipment classes are listed in Table IV.5 and Table IV.6. Energy testing and reverse engineering were conducted on representative units in those equipment classes to develop cost-efficiency relationships for potential design options to reduce energy use. DOE has initially determined that the equipment classes selected are representative of the ACIM market. For those equipment classes not directly analyzed (*i.e.*, the secondary equipment classes), DOE represented the cost-efficiency relationship using the results for directly analyzed equipment classes with similar design characteristics (*e.g.*, the analysis of the continuous, remote condensing and remote compressor, ≥800 and <4,000 equipment class is also representative of the cost-efficiency characteristics of the continuous, remote condensing (but not remote compressor), ≥800 and <4,000 equipment class). *See* Table IV.7.

Table IV.5 Batch Equipment Classes Analyzed in this NOPR

Equipment Type	Condenser Cooling Type	Harvest Rate *lb/24 hours*	Reverse Engineering Unit, Directly Analyzed Equipment Class
Ice-Making Head	Water	>50 and <300	
		≥300 and <785	✓
		≥785 and <1,500	✓
		≥1,500 and <2,500	
		≥2,500 and <4,000	
	Air	>50 and <300	
		≥300 and <727	✓
		≥727 and <1,500	✓
		≥1500 and <4,000	

Equipment Type	Condenser Cooling Type	Harvest Rate *lb/24 hours*	Reverse Engineering Unit, Directly Analyzed Equipment Class
Remote Condensing (but not remote compressor)	Air	>50 and <988	
		≥988 and <4,000	✓
Remote Condensing and Remote Compressor	Air	>50 and <930	
		≥930 and <4,000	
Self-Contained	Water	>50 and <200	
		≥200 and <2,500	
		≥2,500 and <4,000	
	Air	Portable ≤38	✓
		Portable >38 and ≤50	
		Refrigerated Storage	✓
		≤50	✓
		>50 and <134	✓
		≥134 and <200	
		≥200 and <4,000	✓

Table IV.6 Continuous Equipment Classes Analyzed in this NOPR

Equipment Type	Condenser Cooling Type	Harvest Rate *lb/24 hours*	Reverse Engineering Unit, Directly Analyzed Equipment Class
Ice-Making Head	Water	>50 and <801	✓
		≥801 and <1,500	
		≥1,500 and <2,500	
		≥2,500 and <4,000	
	Air	>50 and <310	
		≥310 and <820	✓
		≥820 and <1,500	
		≥1,500 and <4,000	
Remote Condensing (but not remote compressor)	Air	>50 and <800	
		≥800 and <4,000	
Remote Condensing and Remote Compressor	Air	>50 and <800	
		≥800 and <4,000	✓
Self-Contained	Water	>50 and <900	
		≥900 and <2,500	
		≥2,500 and <4,000	
	Air	Portable	
		≤50	
		>50 and <149	✓
		≥149 and <700	✓
		≥700 and <4,000	

Table IV.7 Map of Secondary Classes to the Associated Directly Analyzed Equipment Class

Secondary Equipment Class	Associated Directly Analyzed Equipment Class
B-IMH-W (>50 and <300)	B-IMH-W (≥300 and <785)
B-IMH-W (≥1,500 and <2,500)	B-IMH-W (≥785 and <1,500)
B-IMH-W (≥2,500 and <4,000)	B-IMH-W (≥785 and <1,500)
B-IMH-A (>50 and <300)	B-IMH-A (≥300 and <727)
B-IMH-A (≥1500 and <4,000)	B-IMH-A (≥727 and <1,500)
B-RC(NRC)-A (>50 and <988)	B-RC(NRC)-A (≥988 and <4,000)
B-RC&RC-A (>50 and <930)	B-RC(NRC)-A (≥988 and <4,000)
B-RC&RC-A (≥930 and <4,000)	B-RC(NRC)-A (≥988 and <4,000)
B-SC-A (Portable) (>38 and ≤50)	B-SC-A (Portable) (≤38)
B-SC-W (>50 and <200)	B-SC-A (>50 and <134)
B-SC-A (≥134 and <200)	B-SC-A (>50 and <134)
B-SC-W (≥200 and <2,500)	B-SC-A (≥200 and <4,000)
B-SC-W (≥2,500 and <4,000)	B-SC-A (≥200 and <4,000)
C-IMH-W (≥801 and <1,500)	C-IMH-W (>50 and <801)
C-IMH-W (≥1,500 and <2,500)	C-IMH-W (>50 and <801)
C-IMH-W (≥2,500 and <4,000)	C-IMH-W (>50 and <801)
C-IMH-A (>50 and <310)	C-IMH-A (≥310 and <820)
C-IMH-A (≥820 and <1,500)	C-IMH-A (≥310 and <820)
C-IMH-A (≥1,500 and <4,000)	C-IMH-A (≥310 and <820)
C-RC(NRC)-A (>50 and <800)	C-RC&RC-A (≥800 and <4,000)
C-RC(NRC)-A (≥800 and <4,000)	C-RC&RC-A (≥800 and <4,000)
C-RC&RC-A (>50 and <800)	C-RC&RC-A (≥800 and <4,000)
C-SC-W (>50 and <900)	C-SC-A (>50 and <149)
C-SC-W (≥900 and <2,500)	C-SC-A (≥149 and <700)
C-SC-W (≥2,500 and <4,000)	C-SC-A (≥149 and <700)
C-SC-A (≥700 and <4,000)	C-SC-A (≥149 and <700)
C-SC-A (Portable)	B-SC-A (Portable) (≤38)
C-SC-A (≤50)	C-SC-A (>50 and <149)

See chapter 5 of the NOPR TSD for additional detail on the different units analyzed.

a. Baseline Energy Use

For each equipment class, DOE generally selects a baseline model as a reference point for each class, and measures changes resulting from potential energy conservation standards against the baseline. The baseline model in each equipment class represents the characteristics of equipment typical of that class (*e.g.*, capacity, physical size).

Generally, a baseline model is one that just meets current energy conservation standards, or, if no standards are in place, the baseline is typically the most common or least efficient unit on the market.

For this NOPR, DOE considered the current standards for automatic commercial ice makers when developing the baseline energy use for each analyzed equipment class. In the case of equipment without current standards (*i.e.*, low-capacity ACIM equipment), DOE considered tested energy use of directly analyzed units in a given proposed equipment class to inform the development of baseline energy use.

In response to the March 2022 Preliminary Analysis, AHRI and Hoshizaki commented that DOE's analysis should take into consideration and incorporate refrigerants that can be used going forward, and DOE's analysis should be updated to include A1 refrigerants that can meet the 1500 GWP requirement. (AHRI, No. 21 at p. 4; Hoshizaki, No. 20 at p. 3) AHRI and Hoshizaki also noted that R-290 is limited to 150 grams of charge, and this refrigerant is not practical for larger capacity ice makers so DOE should be mindful of what percentage of machines can use R-290 under the regulations and building codes currently in place. (AHRI, No. 21 at p. 4; Hoshizaki, No. 20 at p. 4)

AHAM commented additionally that DOE has not accounted for the European Union's F-Gas rule and Canadian regulatory developments on refrigerant. (AHAM, No. 27 at p. 12)

AHRI added that DOE must also consider the impact of EPA regulations on lower GWP refrigerants on the ACIM industry, which can have a negative impact on equipment performance, energy consumption, and cost. (AHRI, No. 21 at p. 4) AHRI added its members that have been testing the efficiency of alternative refrigerants and found these low GWP refrigerants can decrease ACIM equipment efficiency by 10 percent, depending on refrigerant and application. (*Id*.)

As recommended by stakeholders, DOE is considering the impact of the December 2022 EPA NOPR in this NOPR. The proposed date of the ban of manufacture or import of refrigerants prohibited in automatic commercial ice makers is at least 2 years earlier than the expected compliance date for any amended ACIM standards associated with the proposals in this document. Hence, the proposed refrigerant prohibitions listed in the December 2022 EPA NOPR are assumed to be enacted for the purpose of DOE's analysis in support of this NOPR. DOE acknowledges that the European Union and Canada have requirements that prohibit certain refrigerants but notes that the December 2022 EPA NOPR will require certain refrigerant prohibitions for automatic commercial ice makers in the United States.

Refrigerants not prohibited from use in automatic commercial ice makers in the December 2022 EPA NOPR are presumed to be permitted for use in automatic commercial ice makers. However, EPA has not yet listed all such potential refrigerants or use conditions as acceptable for use in automatic commercial ice makers.[30] For example, EPA currently lists R-290 as acceptable with use conditions for a refrigerant charge of up to 150 grams in automatic commercial ice makers with non-remote condensers, but DOE expects that EPA will increase the allowable charge to 500 grams to harmonize with the maximum charge quantity allowed by industry safety standards[31] and to be consistent with the December 2022 EPA NOPR (*i.e.*, prohibitions for stand-alone, or non-remote condensing, automatic commercial ice makers with refrigerant

[30] See *www.epa.gov/snap/substitutes-commercial-ice-machines*.
[31] UL Standard 60335-2-89, Edition 2, published on October 27, 2021.

charge capacities of 500 grams or lower, when using or intended to use a regulated substance or a blend containing a regulated substance with a GWP of 150 or greater).

Based on feedback received during manufacturer interviews, public comments,[32] and certified ACIM models,[33] DOE understands that automatic commercial ice makers with harvest rates of up to 500 lb ice/24 h can be produced using an R-290 charge up to 150 grams. Based on feedback received during manufacturer interviews, DOE expects that non-remote condensing ACIM harvest rates of up to 1,500 lb ice/24 h are possible with an R-290 charge of up to 500 grams and that manufacturers will choose R-290 (or, for lower-capacity automatic commercial ice makers, R-600a[34]) in all ACIM models with harvest rates of up to 1,500 lb ice/24 h to comply with the December 2022 EPA NOPR.

DOE expects that the use of R-290 or R-600a generally will improve efficiency as compared with the refrigerants currently in use (*e.g.*, R-404A and R-134a), which are proposed to be prohibited by the December 2022 EPA NOPR, because R-290 and R-600a have higher refrigeration cycle efficiency than the current refrigerants. Thus, for automatic commercial ice makers with harvest rates of up to 1,500 lb ice/24 h with non-remote condensers, DOE expects that the December 2022 EPA NOPR will require redesign that will improve efficiency of these automatic commercial ice makers. Hence, DOE proposes to use baseline levels for automatic commercial ice makers with harvest rates of up to 1,500 lb ice/24 h with non-remote condensers, which reflect the design

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[32] See *www.energystar.gov/sites/default/files/Hoshizaki%20Comment.pdf.*
[33] See *www.energystar.gov/productfinder/product/certified-commercial-ice-machines/results?formId=650720-3-4334-05-6629642&scrollTo=460&search_text=&ice_type_filter=&equipment_type_filter=&brand_name_isopen=0&harvest_rate_lbs_ice_day_filter=&refrigerant_with_gwp_filter=Lower+impact+on+global+warming&markets_filter=United+States&zip_code_filter=&product_types=Select+a+Product+Category&sort_by=harvest_rate_lbs_ice_day&sort_direction=DESC&currentZipCode=23917&page_number=0&lastpage=0.*
[34] DOE expects that EPA will list R-600a as acceptable with use conditions, similar to R-290, for use in automatic commercial ice makers.

changes made by manufacturers in response to the December 2022 EPA NOPR that incorporates refrigerant conversion to R-290 or R-600a to a design at the current baseline level using current refrigerants in this NOPR. The expected efficiency improvement associated with this refrigerant change varies by class and is presented in Table IV.8. DOE's analysis considers that these efficiency improvements, equipment costs, and manufacturer investments required to comply with the December 2022 EPA NOPR will be in effect prior to the time of compliance for the proposed amended DOE ACIM standards for analyzed automatic commercial ice makers with harvest rates of up to 1,500 lb ice/24 h with non-remote condensers.

EPA currently lists certain refrigerants as acceptable that are not prohibited by the December 2022 EPA NOPR for non-remote condensing automatic commercial ice makers with harvest rates above 1,500 lb ice/24 h and all remote condensing automatic commercial ice makers may use (*e.g.*, R-448A and R-449A). DOE expects that EPA will list as acceptable more viable refrigerants for non-remote condensing automatic commercial ice makers with harvest rates above 1,500 lb ice/24 h and all remote condensing automatic commercial ice makers.

DOE reviewed public information regarding refrigerants that are not prohibited by the December 2022 EPA NOPR for non-remote condensing automatic commercial ice makers with harvest rates above 1,500 lb ice/24 h and all remote condensing automatic commercial ice makers may use and found that energy use is comparable to current refrigerants.[35] For non-remote condensing automatic commercial ice makers with harvest rates above 1,500 lb ice/24 h and all remote condensing automatic commercial ice makers, DOE expects that the baseline level for the NOPR analysis is equal to the current

[35] See *www.ahrinet.org/analytics/research/ahri-low-gwp-alternative-refrigerants-evaluation-program?keyword=ice%20maker*.

DOE ACIM energy conservation standard level and that equipment costs and manufacturer investments required to comply with the December 2022 EPA NOPR will be in effect prior to the time of compliance for the proposed amended DOE ACIM standards.

Table IV.8 Proposed December 2022 EPA NOPR R-290 or R-600a Energy Use Baseline

Directly Analyzed Equipment Class	Representative Harvest Rate	Energy Use Reduction Below DOE Standard
B-IMH-W (≥300 and <785)	461	8%
B-IMH-W (≥785 and <1,500)	1470	7%
B-IMH-A (≥300 and <727)	351	4%
B-IMH-A (≥727 and <1,500)	1331	2%
B-RC(NRC)-A (≥988 and <4,000)	1508	0%
B-SC-A (Portable ACIM) (≤38)	28	9%
B-SC-A (Refrigerated Storage ACIM)	6	33%
B-SC-A (<=50)	22	14%
B-SC-A (>50 and <134)	105	12%
B-SC-A (≥200 and <4,000)	227	13%
C-IMH-W (>50 and <801)	760	5%
C-IMH-A (≥310 and <820)	346	9%
C-RC&RC-A (≥800 and <4,000)	1100	0%
C-SC-A (>50 and <149)	144	29%
C-SC-A (≥149 and <700)	230	21%

In response to the March 2022 Preliminary Analysis, the CA IOUs commented that they commend DOE for comparing compressor EERs and would like to see more of this comparison for large ice makers. (CA IOUs, No. 18 at p. 7) The CA IOUs noted that all size machines could benefit from upgraded compressor efficiencies. (*Id.* at p. 6) The CA IOUs commented that these upgraded components are widely available on the market, and that ice maker manufacturers can purchase them in high volume at a reduced price. (*Id.*) The CA IOUs stated that although R-290 compressors are currently limited to 5,000 Btu/h due to charge limits, DOE should perform EER range analysis for R-404A compressors over 5,000 Btu/h in order to provide complete data on compressor efficiency. (*Id*. at p. 8) The CA IOUs commented that this analysis will show the range of efficient and inefficient compressors available on the market for large ice machines rated at more than 500 lb/day. (*Id.*)

AHAM commented that even though efficiency is driven largely by the compressor, a higher efficiency compressor in and of itself does not necessarily drive a higher efficiency ice maker because the harvest cycle is driven by heat build-up within the system, so higher efficiency compressors that generate less heat can have a less efficient harvest cycle, leading to a lower overall efficiency for the ice maker. (AHAM, No. 27 at p. 12)

DOE considered compressors suitable for batch and continuous automatic commercial ice makers based on compressors currently available on the market. For directly analyzed classes that can use up to 500 grams of R-290 and for which there are no R-290 compressors currently available on the market at the compressor capacity required for the representative harvest rate, DOE used the R-404A compressor currently available on the market suitable for batch and continuous automatic commercial ice makers with the highest EER to inform the R-290 baseline in that equipment class.

In this NOPR, DOE used the equation from the March 2022 Preliminary Analysis to account for the reduced energy use improvements of higher efficiency compressors in batch automatic commercial ice makers because the harvest cycle limits the potential energy savings over a whole batch cycle because as batch automatic commercial ice makers typically use hot gas refrigerant to release the ice cubes from the evaporator during a harvest. See chapter 5 of the NOPR TSD for additional detail.

In this NOPR, DOE did not consider additional compressor efficiency improvements beyond the baseline because DOE expects that the compressors currently available on the market for refrigerants used to comply with the December 2022 EPA NOPR represent the maximum compressor efficiency achievable for each respective equipment class.

The CA IOUs commented that the ice making mechanism for refrigerated storage ice makers is distinct from all commercial automatic commercial ice makers in that the ice is frozen by the air inside the refrigerated cavity rather than the ice making mechanism. (CA IOUs, No. 18 at p. 3) The CA IOUs added that this ice making mechanism, identified by DOE for refrigerated storage automatic commercial ice makers, is almost identical to the ice making mechanism in residential refrigerator/freezer combinations. (*Id.*) The CA IOUs stated that DOE should base allowable energy usage consumption of refrigerated storage ice makers on the assumption of 12.8 kWh/100 lb, as used in the residential refrigerator/freezer rulemaking, rather than the 44.7 kWh/100 lb that is assumed in the preliminary TSD. (*Id.* at p. 4) The CA IOUs commented that allowing such high energy consumption for this product category would leave substantial energy savings unrealized. (*Id.*) The CA IOUs recommended DOE select a higher efficiency level for the refrigerated storage product class. (*Id*. at p. 3)

As discussed in section IV.A.1.a of this document, refrigerated storage automatic commercial ice makers have different energy use characteristics than automatic commercial ice makers without refrigerated storage. For refrigerator-freezers and freezers, the energy use associated with maintaining the cold ice storage bin temperature is covered by the test procedure and energy conservation standard absent consideration of energy use for making ice. In contrast, for refrigerated storage automatic commercial ice makers, the energy use required to keep the interior at freezing temperature during active icemaking is included in the test procedure and thus must be included in the energy conservation standards. The baseline energy use of refrigerated storage automatic commercial ice makers was developed through test data conducted in support of this proposed rulemaking.

AHRI stated that DOE's assumption that energy use values scale to other more traditional ACIM equipment is likely not accurate and that DOE should explain how its analysis was performed for non-representative units. (AHRI, No. 21 at p. 9)

For those equipment classes not directly analyzed (*i.e.*, the secondary equipment classes), DOE represented the cost-efficiency relationship using the results for directly analyzed equipment classes with similar design characteristics (*e.g.*, the analysis of the C.RCRC.A.4000 equipment class is also representative of the cost-efficiency characteristics of the C.RCNRC.A.4000 equipment class).

AHAM commented that DOE should test and tear down an adequate number of residential low-capacity automatic commercial ice makers, noting that DOE only analyzed three low-capacity units and only tore down one. (AHAM, No. 27 at pp. 11–12) AHAM also commented that DOE's energy use analysis, design options, costs, and baseline and more efficient efficiency levels are likely inaccurate due to the limited testing. (*Id.* at p. 12) Additionally, AHAM commented that due to lack of testing of residential products, DOE's modeling does not account for the fact that the harvest cycle is not predictable and does not lead to predictable results. (*Id.* at pp. 12—13)

The CA IOUs commented that DOE could provide anonymous data on the low-capacity units it has tested and confirm the usage scenarios for the products to confirm they would have commercial applications. (CA IOUs, No. 18 at p. 3)

In support of this NOPR, DOE tested and tore down seven portable automatic commercial ice makers (five batch and two continuous), four refrigerated storage automatic commercial ice makers (all batch), and six low-capacity, self-contained, air-cooled automatic commercial ice makers (four batch and two continuous) that are representative of the low-capacity automatic commercial ice maker market.

DOE requests comments on its proposal to use baseline levels for automatic commercial ice makers based upon the design changes made by manufacturers in response to the December 2022 EPA NOPR.

b. Higher Efficiency Levels

As part of DOE's analysis, the maximum available efficiency level is the highest efficiency unit currently available on the market. DOE also defines a "max-tech" efficiency level to represent the maximum possible efficiency for given equipment.

After conducting the screening analysis described in section IV.B of this document and chapter 4 of the NOPR TSD, DOE considered the remaining design options in the engineering analysis to achieve higher efficiency levels. See chapter 5 of the NOPR TSD for additional detail on the design options.

Joint Commenters encouraged DOE to reconsider the max-tech levels for certain product classes where there are models listed in the CCD that are more efficient than the "max-tech" levels in the March 2022 Preliminary TSD. (Joint Commenters, No. 22 at pp. 1–2) Joint Commenters added that this discrepancy is particularly large for the high-capacity continuous, remote condensing and remote compressor, air-cooled equipment. (*Id.* at p. 1)

DOE reconsidered the max-tech levels for all directly analyzed equipment classes and updated its engineering analysis in this NOPR based on stakeholder and manufacturer feedback, test data, and market information.

AHAM commented that, in their understanding, the existing standards for automatic commercial ice makers drove changes to ice shape, style, clarity, and chewability. (AHAM, No. 27 at p. 12) AHAM noted that clear, cube ice is an important consumer feature that may make higher efficiencies more difficult to achieve. (*Id.*)

As discussed in section IV.B of this document and chapter 4 of the NOPR TSD, DOE considers the impacts on product utility as part of the screening analysis. If a technology is determined to have a significant adverse impact on the utility of the product to 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 United States at the time, that technology will not be considered further. DOE did not receive any comments in response to the March 2022 Preliminary Analysis specific to the screening analysis. When developing the baseline energy use discussed in section IV.C.1.a of this document, DOE analyzed clear, standard-sized cube style batch automatic commercial ice makers and nugget style continuous automatic commercial ice makers. Therefore, the efficiency levels presented in this NOPR are based on these ice characteristics.

AHAM commented that residential products will be restricted in available technology options, especially larger compressors and evaporators, because they are constrained by space, whether they be undercounter or portable; whereas commercial ice makers are floor or countertop mounted and have the ability to increase the appliance height to accommodate larger evaporators. (*Id.* at p. 12)

In this NOPR, DOE did not consider design options that expanded the size or footprint of an automatic commercial ice maker because automatic commercial ice makers are typically used in locations prioritizing smaller equipment footprints (*e.g.*, commercial kitchens) and larger cabinet sizes may adversely impact the availability of equipment with current sizes at a given harvest rate. DOE only considered increases to the size of remote condensers but limited remote condenser growth to the largest remote condenser currently available on the market in each equipment class.

Joint Commenters encouraged DOE to include an efficiency level that incorporates microchannel condensers with increased surface area for air-cooled, non-remote condensing automatic commercial ice makers to fully capture the potential energy savings from this design option. (Joint Commenters, No. 22 at p. 2)

Joint Commenters also pointed out that in DOE's March 2022 Preliminary Analysis, DOE shows small energy savings from replacing a tube-and-fin condenser with a microchannel condenser for non-remote condensing product classes, and stated their concern that by implementing a compact microchannel condenser design in these classes, DOE is underestimating the potential energy savings associated with this design. (*Id.*)

Joint Commenters stated that it understood that DOE could increase heat exchange area with a microchannel condenser without increasing the overall condenser size relative to the original component for non-remote condensing product classes. (*Id.* at pp. 2–3)

Joint Commenters also commented that they encouraged DOE to capture the larger potential energy savings by assuming a microchannel condenser that has increased surface area relative to the tube-and-fin condenser, while being no larger in overall dimensions than the original component. (*Id.,* at p. 3)

When analyzing the potential energy use reduction of microchannel condensers in automatic commercial ice makers, DOE assumed that the face area of the condenser would remain the same but that the heat transfer would increase by 25 percent due to the greater surface area in microchannel condensers when compared to tube and fin condensers. See chapter 5 of the NOPR TSD for additional information.

2. Cost Analysis

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

- Physical teardowns: Under this approach, DOE physically dismantles a commercially available equipment, component-by-component, to develop a detailed bill of materials for the equipment.

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

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

In the present case, DOE conducted the analysis using both physical teardowns and catalog teardowns as well as feedback from manufacturers during interviews. See chapter 5 of the NOPR TSD for additional details.

DOE received several comments in response to the March 2022 Preliminary Analysis regarding the Cost Analysis.

AHRI requested input from DOE on what sections of manufacturer production costs require additional data for DOE to complete its analysis so industry can provide cost feedback. (AHRI, No. 21 at p. 4)

AHAM commented that in examining costs associated with amended standards, DOE does account for inflation, but it has done so using typical inflation rates. (AHAM, No. 27 at p. 13) AHAM noted that DOE must recognize that current inflation rates are much higher than is typical, and that DOE should account for the recent inflation spike in its analysis, which is significant and will likely impact purchases of products and manufacturer costs for a fairly long period of time. (*Id.*)

NAFEM commented that as it understands the results of the Engineering Analysis presented in Section 5.6 of the March 2022 Preliminary TSD, the cost-efficiency curves were developed, at least in part, based on 2015 costs that were adjusted to 2020 dollars. (NAFEM, No. 19 at p. 3) NAFEM suggested that using actual costs in 2022 provides a more sound analysis and would reflect the current economic situation of rising inflation and part shortage that has affected part costs. (*Id.*)

Hoshizaki requested that the data be reviewed for 2022 market conditions, considering that the last review was for 2019, prior to the pandemic. (Hoshizaki, No. 20 at p. 2) Hoshizaki added that part shortages and staff shortages have reduced part and inventory availability. (*Id.*) Hoshizaki also commented that for parts costs, the May 5, 2022, public meeting revealed that DOE simply converted 2015 estimates to 2020 dollar values. (*Id*. at p. 3) Hoshizaki recommended that DOE should update these values to reflect recent cost increases and inflation, given that the last 2 years have seen huge spikes in part, raw material, labor, and shipping costs among other factors that have affected the industry. (*Id.*) Hoshizaki commented that the data in the TSD does not adequately reflect current price gaps for efficient parts at 2022 prices, including compressors, fan motors, pump motors, and gear motors. (*Id.*)

AHRI commented that DOE's methodology of updating 2015 cost estimates to 2020-dollar values fails to account for supply chain shortages and labor market disruptions stemming from the COVID-19 pandemic, which has caused the cost of parts to outpace the historically high rates of inflation. (AHRI, No. 21 at p. 3) AHRI recommended that DOE should update the cost values based on 2022 prices for design options, including compressors, fan motors, pump motors, and gear motors. (*Id.*)

DOE updated its cost assumptions in this NOPR based on feedback provided by manufacturers in response to the March 2022 Preliminary Analysis and during manufacturer interviews. See chapter 5 of the NOPR TSD for additional details.

Additionally, Hoshizaki commented that baseline selling prices for equipment in Tables 8.2.3 and 8.2.4 are drastically low prices for machines. (Hoshizaki, No. 20 at p. 3) Hoshizaki commented that DOE should clarify how it can estimate a baseline price of $2,562 for a continuous ACIM between 800 and 4,000 pounds of daily ice capacity or $2,007 for a batch ACIM between 800 and 1,500 pounds of daily ice capacity. (*Id.*)

AHRI commented that automatic commercial ice makers with harvest rates between 800 and 4,000 lb/day have a baseline price of $2,562 for continuous and $2,007 for batch in the March 2022 Preliminary Analysis, which is not representative of the market. (AHRI, No. 21 at p. 3)

DOE developed the baseline costs for representative units based on physical teardown information. DOE has updated its costs based on manufacturer feedback and based on 2022 prices for materials and components.

AHRI commented that the new equipment categories were cited by DOE as some of the lowest cost, and that increasing efficiency will require a disproportionate increase in cost or reduction in performance/features/capacity. (*Id*. at p. 9)

DOE directly analyzed three low-capacity automatic commercial ice maker classes and conducted testing and teardowns in each as discussed in section IV.C.1.a of this document. Therefore, DOE has tentatively determined that the low-capacity automatic commercial ice maker classes are representative of the market costs and efficiency levels.

Hoshizaki and NAFEM commented that the analysis in the March 2022 Preliminary Analysis shows only a minimal increase for changing from non-flammable refrigerant to flammable refrigerant, and that the analysis should consider increased cost for spark-resistant components, cost for agency testing to approve use of new refrigerants, and costs associated with changing production areas to accommodate flammable refrigerant safety requirements. (Hoshizaki, No. 20 at p. 3; NAFEM, No. 19 at p. 3) Hoshizaki added that it is happy to review with DOE the costs incurred when changing its refrigerator and freezer manufacturing lines for use with R-290, and that with more flammable refrigerant use soon for automatic commercial ice makers, a full analysis would be beneficial. (Hosizaki, No. 20 at p. 3)

PEG commented that additional testing and certification requirements only increase the cost of the equipment that must be passed on to the buyer increasing inflationary pressure already running rampant in our economy. (PEG, No. 28 at p. 1)

DOE included the costs for spark-proof components in the baseline costs in classes where R-290 or R-600a was included in the baseline. As discussed in section IV.C.1.a of this document, the equipment costs and manufacturer investments required to comply with the December 2022 EPA NOPR will be in effect prior to the time of compliance for the proposed amended DOE ACIM standards. See section V.B.2.e of this document for a discussion on how DOE incorporated the costs associated with retrofitting manufacturing facilities for flammable refrigerants.

The CA IOUs commented that top efficiency levels usually include integrating a drain water heat exchanger, which adds significant manufacturing costs. (CA IOUs, No. 18 at p. 6) Also, the CA IOUs acknowledged also the price volatility in the electronically commutated motor (ECM) market due to supply chain disruptions caused by the coronavirus pandemic, but stated that these are short-term fluctuations and should be ignored, given the long-term horizon of DOE's analysis. (*Id.*)

NAFEM requested information on how the cost information was obtained. (NAFEM, No. 19 at p. 3) NAFEM commented that it understands that commercially available ECM condenser fan motors can cost $150 to $200 more than permanent split capacitor (PSC) condenser fan motors. (*Id.*) NAFEM stated that this is an order of magnitude higher than the cost differential DOE shows on the table between these two design options. (*Id.*)

DOE updated its motor cost assumptions in this NOPR based on feedback provided by manufacturers in response to the March 2022 Preliminary Analysis and during manufacturer interviews. See chapter 5 of the NOPR TSD for additional details.

DOE seeks comment on the method for estimating manufacturing production costs.

3. Cost-Efficiency Results

The results of the engineering analysis are reported as cost-efficiency data (or "curves") in the form of energy use (in kWh/100 lb) versus manufacturer selling price (MSP) (in dollars). DOE generated cost-efficiency curves for the directly analyzed equipment classes based on overall ACIM MPCs. DOE generally ordered design options beyond the baseline based on cost-effectiveness. The methodology for developing the curves started with determining the energy use for baseline equipment and MPCs for this equipment. Above the baseline, DOE implemented design options using the ratio of cost to energy savings and implemented only one design option at each level. Design options were implemented until all available technologies were employed (*i.e.*, at a max-tech level). See TSD chapter 5 for additional details on the engineering analysis and complete cost-efficiency results.

In response to the March 2022 Preliminary Analysis, the CA IOUs commented that DOE's analysis shows the added manufacturing cost to implement the efficiency features considered in ELs 3–4 is relatively low, and that these improvements result in significant energy savings. (CA IOUs, No. 18 at p. 6) The CA IOUs commented also that for self-contained machines and ice-making heads under 700 lb/day, these features include upgrading from R404a to R290 refrigeration systems, which are proven to be 20 to 30 percent more efficient. (*Id.*) The CA IOUs stated that shaded pole motor (SPM) to PSC condenser fan motor upgrades are very cost effective for all machines, and for larger machines, PSC to ECM condenser fan motor upgrades are more cost effective. (*Id.*) The CA IOUs commented that SPM to PSC auger motor upgrades for water-cooled machines are very cost effective, and PSC to ECM auger motor upgrades are more cost effective for larger machines. (*Id.*) The CA IOUs added that ELs 3 and 4 for almost all categories are very cost-effective, and in some product classes, even higher ELs are highly cost-effective, leading to a net benefit for most consumers. (*Id.*) The CA IOUs concluded that they agree with DOE's analysis showing ELs 3–4 as very cost effective. (*Id.*)

4. Manufacturer Selling Price

To account for manufacturers' non-production costs and profit margin, DOE applies a multiplier (the manufacturer markup) to the MPC. The resulting MSP is the price at which the manufacturer distributes a unit into commerce. DOE developed an average manufacturer markup by examining the annual Securities and Exchange Commission (SEC) 10-K reports[36] filed by publicly traded manufacturers whose combined product range includes automatic commercial ice makers. See section IV.J.2.d of this document or chapter 12 of the NOPR TSD for additional detail on the manufacturer markup.

In response to the March 2022 Preliminary Analysis, AHRI suggested that DOE reach out to manufacturers of the new low-capacity equipment to determine a more accurate manufacturer markup. (AHRI, No. 21 at p. 9) Scotsman commented also on the 1.25 manufacturer markup used in the March 2022 Preliminary Analysis. Scotsman stated that the manufacturer markup was not substantiated by current data and that estimates of past financial data was not reflective of the current economy and should not be used in the development of regulations. (Scotsman, No. 30 at p. 9)

DOE interviewed manufacturers accounting for approximately 69 percent of covered ACIM shipments and 57 percent of low-capacity shipments. Based on feedback from confidential interviews, in this NOPR DOE maintained the 1.25 industry average markup for all equipment classes, including the new proposed low-capacity equipment classes. DOE recognizes that this estimate may not represent an individual company's manufacturer markup. Industry feedback indicates that manufacturer markups vary based on a range of factors, including its marketed end-use (*i.e.*, residential versus commercial). However, as low-capacity classes are not delineated by end-use, DOE used market share

[36] U.S. Securities and Exchange Commission, *Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system.* Available at *www.sec.gov/edgar/search/* (last accessed December 15, 2022).

weights to calculate the 1.25 industry average. See section IV.J.2.d of this document or chapter 12 of the NOPR TSD for additional details.

D. Markups Analysis

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

DOE developed baseline and incremental markups for each actor in the distribution chain. Baseline markups are applied to the price of products with baseline efficiency, while incremental markups are applied to the difference in price between baseline and higher-efficiency models (the incremental cost increase). The incremental markup is typically less than the baseline markup and is designed to maintain similar per-unit operating profit before and after new or amended standards.[37]

For automatic commercial ice makers, the main parties in the distribution chain are manufacturers, wholesalers, and mechanical contractors.

In response to the March 2022 Preliminary Analysis, AHRI commented that low-capacity equipment classes have different distribution channels and buying patterns

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

compared to large capacity ACIM equipment, and that DOE should analyze these sets of consumers differently. (AHRI, No. 21 at p. 9)

DOE's mark-up analysis assumes a portion of the automatic commercial ice makers are purchased through wholesalers and a portion are purchased via mechanical contractors.

DOE relied on economic data from the U.S. Census Bureau to estimate average baseline and incremental markups.

DOE received no other comments related to markups in the distribution chain in response to the March 2022 Preliminary Analysis.

Chapter 6 of the NOPR TSD provides details on DOE's development of markups for automatic commercial ice makers.

E. Energy and Water Use Analysis

The purpose of the energy use analysis is to determine the annual energy consumption of automatic commercial ice makers at different efficiencies in representative U.S. commercial buildings, and to assess the energy savings potential of increased ACIM efficiency. The energy use analysis estimates the range of energy use of automatic commercial ice makers in the field (*i.e.*, as they are actually used by consumers). The energy use analysis provides the basis for other analyses DOE performed, particularly assessments of the energy savings and the savings in consumer operating costs that could result from adoption of amended or new standards.

DOE received several comments in response to the March 2022 Preliminary Analysis regarding the Energy Use and Water Use Analysis.

1. Ice Storage

The Joint Commenters encouraged DOE to evaluate potential standards that include the energy use associated with ice storage. (Joint Commenters, No. 22 at p. 3) The Joint Commenters commented that the effectiveness of a storage bin at keeping ice cold has an indirect impact on the energy use of an automatic commercial ice maker. (*Id.*) The Joint Commenters stated that a bin that is well-insulated, meaning it has a relatively slow melt of the stored ice, will reduce the frequency of ice replacement cycles (*i.e.*, when the automatic commercial ice maker is actively using energy to make and harvest ice). (*Id.*)

In the November 2022 Test Procedure Final Rule, DOE determined that the measurement of active mode energy use, when an ice maker is actively producing ice, and the metric of energy use per 100 pounds of ice represent a repeatable and reproducible test method that is reasonably designed to produce test results which reflect energy use during a representative average use cycle. 87 FR 65856, 65888. Therefore, DOE did not amend its test procedures to account for standby or ice storage energy use. *Id.*

DOE determined that the contribution of any standby mode energy use to overall energy use can vary significantly depending on the specific installation and end use of the automatic commercial ice maker. *Id*. at 87 FR 65887. Because automatic commercial ice makers may be installed and operated in a range of end uses (*e.g.,* commercial kitchens, offices, schools, hospitals, hotels, and convenience stores), determining the performance based on the metric of energy use per 100 pounds of ice during an automatic ice makers active mode best reflects energy efficiency, energy use, or estimated annual operating cost of a given type of covered equipment during a representative average use cycle while not being unduly burdensome to conduct, consistent with 42 U.S.C. 6314(a)(2). *Id*. at 87 FR 65887-65888.

DOE also determined that IMHs and RCU ice makers are typically paired in the field with a storage bin chosen by the end user, rather than the manufacturer, which can result in IMHs and RCU ice makers paired with storage bins from a different manufacturer. *Id*. at 87 FR 65888. DOE acknowledged that self-contained ice makers contain a storage bin that is integral to the automatic commercial ice maker. *Id.* However, the energy use associated with ice storage of all automatic commercial ice makers, including self-contained ice makers, can vary significantly depending on the specific installation and end use of the automatic commercial ice maker. *Id.*

Consistent with the November 2022 Test Procedure Final Rule, DOE has not included ice storage as a design option in this analysis because the DOE test procedure at 10 CFR 431.134 measures the ACIM equipment energy use during the active mode. Therefore, the energy use analysis in this document did not account for an indirect energy use (or savings) from ice storage in this analysis.

2. Scaling

In the March 2022 Preliminary Analysis, DOE stated that, for non-representative equipment classes, DOE scaled the energy values from representative equipment classes (*see* Chapter 9 of the March 2022 Preliminary Analysis TSD). In response, Scotsman commented that energy use values cannot be scaled for low-capacity ACIM equipment, as design and construction of these products are not intended for the same applications as large capacity ACIM equipment. (Scotsman, No. 30 at p. 9)

DOE did not scale energy use for low-capacity ACIM equipment. DOE developed an engineering analysis for low-capacity ACIM equipment. The energy use analysis utilized harvest rates and efficiency level data from the engineering analysis.

3. Harvest Rate

In response to the March 2022 Preliminary Analysis, AHAM commented that, due to lack of testing of low-capacity equipment, DOE's modeling does not account for the fact that the harvest cycle is not predictable and does not lead to predictable results. (AHAM, No. 27 at pp. 12–13) In addition, Scotsman stated that the performance (harvest rate and efficiency) of automatic commercial ice makers varies with electrical, environmental, and ambient conditions. (Scotsman, No. 30 at p. 5)

DOE analyzed low-capacity units and determined the harvest rate in the engineering analysis. DOE's analysis within the engineering analysis utilizes the ACIM test procedure. The test procedure exists to standard testing variation related to electrical, environmental, and ambient conditions. Using the ACIM test procedure processes to develop the engineering analysis allows for a direct comparison of units. The energy and water use analysis incorporates a representative harvest cycle for low-capacity ice makers.

The automatic commercial ice maker test procedure addresses variability to ACIM performance and acceptable tolerances for testing ACIM equipment (10 CFR 431.134). For the energy use analysis, DOE relies on the harvest rate and efficiency developed as part of the Engineering Analysis (*see* section IV.C of this document).

4. Duty Cycle

In response to the March 2022 Preliminary Analysis, Scotsman stated that the annual energy usage analysis did not reflect the overall application of automatic commercial ice makers. Scotsman stated that utilization factors varied across the applications of automatic commercial ice makers. (Scotsman, No. 30, p. 5)

In the January 2015 Final Rule, DOE discussed a review of utilization factors for ACIM equipment including comments submitted by manufacturers and other organizations. In the January 2015 Finale Rule, DOE utilized a 42 percent capacity factor to estimate energy usage for the LCC and NIA models. 80 FR 4646, 4696. DOE notes that terms “capacity factor” in the January 2015 ACIM Final Rule, “utilization factor” in Scotsman’s comment, and, “duty cycle” in this NOPR“” are all the same functions, just different terms.

GEA stated that low-capacity ACIM equipment, and particularly portable ACIM, have intermittent use at times. GEA suggested that the use should be factored into standards for this equipment. (GEA, No. 31, p. 2)

During the May 5, 2022, public meeting, Welbilt acknowledged the 42 percent utilization rate. Welbilt did not suggest that 42 percent was incorrect for large-capacity ACIM equipment. However, Welbilt stated that for low-capacity ACIM equipment, and specifically portable ACIM, a lower utilization rated is more appropriate. (Public Meeting Transcript, No. 25 at pp. 37–38)

Whirlpool commented that the energy savings potential of low-capacity ACIM equipment is greatly over-exaggerated and cited lower estimated daily ice usage for such products. (Whirlpool, No. 26 at p. 3)

AHRI commented that some of these low-capacity ACIM equipment may be considered “residential,” which would result in different operating and utilization characteristics. (AHRI, No. 21 at p. 2) AHRI added that residential equipment is not appropriately addressed in the March 2022 Preliminary TSD and has different consumer purchasing habits, as utilization rates would likely be an order of magnitude lower than commercial equipment, which affects the purchase behavior of consumers. (AHRI, No. 21 at p. 7) AHRI requested that DOE show how it obtained a utilization factor for residential equipment and consumer purchase behavior for this type of equipment. (*Id.*) AHRI commented that behaviors, use cases, and run time/duty cycle of low-capacity ACIM equipment may be different from larger ACIM equipment. (*Id.* at p. 9) Additionally, AHRI stated in a comment related to consumer subgroups, that low-capacity ACIM equipment (residential consumers) operate ACIM equipment oftentimes below 10 percent utilization in contrast to the 42 percent applicable to large-capacity ACIM equipment. (*Id.*)

DOE could not find published research on the duty cycle of low-capacity ACIM equipment. However, DOE’s review of low-capacity ACIM equipment found most marketing literature claiming the equipment made ice frequently (less than 10 minutes). DOE inquired about duty cycle for low-capacity ACIM equipment as part of the MIA interview process. DOE received responses of 10–20 percent utilization for low-capacity ACIM equipment. Therefore, in this NOPR energy use analysis, DOE used a duty cycle of 14 percent for low-capacity ACIM equipment.

In the March 2022 Preliminary Analysis, DOE used a flat duty cycle (42 percent) for all equipment classes as well as efficiency levels in all building types. In the energy use analysis for this NOPR, DOE used a nominal value of 42 percent for duty cycle for large-capacity ACIM equipment and 14 percent for low-capacity ACIM equipment. However, DOE varied the duty cycle in the Monte Carlo analysis portion of the LCC analysis. Varying duty cycle as part of the Monte Carlo analysis varies the energy use of the automatic commercial ice makers.

5. Low-Capacity ACIM Equipment

In response to the March 2022 Preliminary Analysis, Whirlpool commented that the energy savings potential of low-capacity ACIM equipment is greatly over-exaggerated, citing lower estimated daily and annual ice usage compared to commercial ice makers and the low annual shipments of these products. (Whirlpool, No. 26 at pp. 3–4) Whirlpool stated that these are niche product in the U.S. market, and nowhere close to a majority of households own one of these appliances, and, therefore the national energy savings potential will be small from such a low number of annual shipments. (*Id.*)

DOE addresses national energy savings and shipments of low-capacity ACIM equipment in other sections of this document. DOE calculated the energy and water use of all ice makers (regardless of capacity) on the applicable harvest rate of the representative ice maker and the related energy use numbers of the baseline and efficiency levels.

6. Water Use

In response to the March 2022 Preliminary Analysis, AHAM noted that DOE did not plan to develop standards for potable water use for low-capacity ice makers. (AHAM, No. 27 at p. 13) AHAM agreed that DOE should not develop standards for potable water use, given that not only are the residential products used infrequently, but portable ice makers in particular are not plumbed in. (*Id.*) Moreover, AHAM noted that limits on potable water usage would negatively impact a product's ability to make clear, cube ice, which is a key consumer utility for many residential ice makers. (*Id.*)

Consistent with the March 2022 Preliminary Analysis, DOE does not plan to develop standards for potable water use for low-capacity makers in this NOPR. However, DOE does account for potable water use (where applicable) of the automatic commercial ice makers in this analysis.

F. Life-Cycle Cost and Payback Period Analysis

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

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

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

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

Inputs to the calculation of total installed cost include the cost of the equipment—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, equipment lifetimes, and discount rates. DOE created distributions of values for equipment 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 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 ACIM user samples. For this rulemaking, the Monte Carlo approach is implemented in MS Excel together with the Crystal Ball™ add-on.[38] The model calculated the LCC for equipment at each efficiency level for 10,000 consumers per simulation run. The analytical results include a distribution of 10,000 data points showing the range of LCC

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[38] Crystal Ball™ is a commercially available software tool to facilitate the creation of these types of models by generating probability distributions and summarizing results within Excel, available at *www.oracle.com/technetwork/middleware/crystalball/overview/index.html* (last accessed January 15, 2023).

savings for a given efficiency level relative to the no-new-standards case efficiency distribution. In performing an iteration of the Monte Carlo simulation for a given consumer, equipment efficiency is chosen based on its probability. If the chosen equipment efficiency is greater than or equal to the efficiency of the standard level under consideration, the LCC calculation reveals that a consumer is not impacted by the standard level. By accounting for consumers who already purchase more-efficient products, DOE avoids overstating the potential benefits from increasing product efficiency.

In the March 2022 Preliminary Analysis, DOE stated that the Monte Carlo 10,000 simulations have an assumption that consumers purchase equipment at least as efficient as the ones they would purchase in the absence of standards. DOE sought comment on this assumption.

In response to this request for comment, Scotsman stated that consumers are not significantly influenced by energy efficiency claims. Consumers select automatic commercial ice makers based on cost and ice production as a function of space, and reliability. (Scotsman, No.30 at p. 6)

DOE agrees that consumers select automatic commercial ice makers based on cost, ice production, and other parameters. Although Scotsman states that consumers are not significantly influenced by energy efficiency claims, neither Scotsman nor any other commenter disputed the assumption that consumers would purchase equipment at least as efficient as the ones they would purchase in the absence of standards. Therefore, DOE retained this buying strategy when DOE analyzed LCC and PBP of ACIM consumers.

DOE calculated the LCC and PBP for consumers of automatic commercial ice makers as if each were to purchase a new product in the expected year of required compliance with new or amended standards. New and amended standards would apply to automatic commercial ice makers manufactured 3 years after the date on which any new or amended standard is published. (42 U.S.C. 6313(d)(2)B)(i)) At this time, DOE estimates publication of a final rule in 2024. Therefore, for purposes of its analysis, DOE used 2027 as the first year of compliance with any amended standards for automatic commercial ice makers.

DOE requested comment in the March 2022 Preliminary Analysis regarding how DOE presents the average LCC savings, and the percent of consumers affected by a standard using no-new-standards-case and standards-case efficiency distributions. In response, Scotsman stated that the LCC savings estimates are not reflective of the current economic environment and are unsubstantiated by current data. (Scotsman, No. 30 at p. 7)

DOE agrees that the LCC and related savings do not directly reflect the current economic environment, but rather a mixture of current data and a purchase in the first year of compliance of a new or amended standard. Again, the LCC and PBP calculations are based on a purchase of the ACIM equipment in 2027, the estimated first year of compliance with any amended standards. The LCC and PBP calculations use current data (*i.e.*, equipment costs, energy costs, water costs, etc.) and determine the life-cycle costs of equipment purchased in 2027.

Table IV.9 summarizes the approach and data DOE used to derive inputs to the LCC and PBP calculations. The subsections that follow provide further discussion.

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.9 Summary of Inputs and Methods for the LCC and PBP Analysis*

Inputs	Source/Method
Product Cost	Derived by multiplying MPCs by manufacturer and retailer markups and sales tax, as appropriate. Used historical data to derive a price scaling index to project 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 2018 CBECS.
Energy and Water Prices	Electricity: Based on EIA's Form 861 data for 2021. Variability: Energy prices vary by state. Water: Based on 2021 American Water Works Association Water and Wastewater Rate survey data. Variability: Water prices vary by state.
Energy and Water Price Trends	Electricity: Based on *AEO2022* price projections. Variability: Regional energy price trends determined for 9 regions. Water: Based on 2021 American Water Works Association Water and Wastewater Rate survey data. Variability: Water price trends vary by state.
Repair and Maintenance Costs	May vary by efficiency level.
Product Lifetime	Average: 8.5 years except 7.5 years for low-capacity automatic commercial ice makers.
Discount Rates	Approach involves identifying all possible debt or asset classes that might be used to purchase the considered equipment, or might be affected indirectly. Primary data source was Damodaran Online.
Compliance Date	2027

* Not used for PBP calculation. 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.

In response to the March 2022 Preliminary Analysis regarding equipment costs, AHRI commented that the costs included in DOE's assumptions do not reflect current market realities, as noted by AHRI's comments related to consumer purchases and lifetime modeling of low-capacity ACIM equipment. (AHRI, No. 21, p. 7)

DOE addresses low-capacity ACIM equipment lifetime and consumer purchases in the applicable sections in this document.

In the March 2022 Preliminary Analysis, DOE requested comment on the overall methodology and results of the LCC and PBP analyses (Executive Chapter of the March 2022 Preliminary Analysis TSD). In response to that request, Scotsman made five comments, which DOE responds to in turn.

First, Scotsman stated that the LCC and PBP analyses underestimate equipment cost increases associated with material, component, and labor costs in the current economic environment. (Scotsman, No. 30 at p. 7)

DOE acknowledges the comment from Scotsman but disagrees with the statement that the LCC and PBP analyses underestimate equipment cost increases associated with material, component, and labor costs because the LCC and PBP are from the consumer's perspective. Equipment costs are developed in the Engineering Analysis and not in either the LCC or PBP analyses.

Second, Scotsman stated that LCC and PBP analyses overestimate the total efficiency savings opportunity associated with the market size for automatic commercial ice makers. (*Id*.)

DOE acknowledges the comment from Scotsman but disagrees with the statement that the LCC and PBP analyses overestimate the total efficiency opportunity associated with the market size because the LCC and PBP are from the consumer's perspective. The LCC and PBP analyses utilize efficiency data from the engineering analysis. Further, the LCC and PBP do not factor in market size other than when calculating a weighted average output of LCC and PBP results.

Third, Scotsman stated that LCC and PBP analyses underestimate capital requirements to accommodate the technology options proposed. (*Id*.)

Again, DOE acknowledges the comment from Scotsman but disagrees with the statement that the LCC and PBP analyses underestimate capital requirements because the LCC and PBP analyses are from the consumer's perspective. Capital requirements would be addressed in the MIA, or potentially in the Engineering Analysis, and not in either the LCC or PBP analyses.

Fourth, Scotsman stated that LCC and PBP analyses underestimate warranty increases that accompany the launch of the proposed technology options. (*Id*.)

DOE acknowledges the comment from Scotsman but disagrees with the statement that the LCC and PBP analyses underestimate warranty increases that accompany the launch of the proposed technology option because the LCC and PBP analyses are from the consumer's perspective. DOE does not factor in the either the purchase of a warranty or the use of warranty in the LCC and PBP analyses. As this comment might relate to the expense of warranty supported by manufacturer, that expense would be addressed in the MIA and not in either the LCC or PBP analyses.

Finally, Scotsman stated that LCC and PBP analyses do not include accurate estimates for opportunity cost loss by developing and producing equipment without requested technology or features. (*Id*.)

DOE acknowledges the comment from Scotsman but disagrees with the statement that the LCC and PBP analyses do not include accurate estimates for opportunity loss for developing/producing equipment because the LCC and PBP analyses are from the consumer's perspective. Costs to develop or produce equipment are addressed in the MIA, or potentially in the Engineering Analysis, and not in either the LCC or PBP analyses.

1. Equipment Cost

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

Automatic commercial ice makers are comprised of different components. DOE's research indicates future flat prices for most of the components. DOE included future price reductions for semiconductor and similar technologies. Semiconductor technology price learning applies to efficiency levels that include design options with ECMs (including condenser fan motor, pump motor, and auger motor). Price learning applies to a proportion of the ECM cost representing the semiconductor technology.

Some variable-speed compressors have price-learning. However, automatic commercial ice makers do not utilize variable-speed compressors. Therefore, DOE did not apply price learning to compressor components in ACIM equipment.

2. Installation Cost

Installation cost includes labor, overhead, and any miscellaneous materials and parts needed to install the product. DOE used data from RS Means to estimate the baseline installation cost for automatic commercial ice makers. DOE found no evidence to suggest that installation costs would be affected by increased efficiency levels. In the

March 2022 Preliminary Analysis, DOE used the same installation cost for the baseline and increased efficiency level equipment.

In response to this approach in the March 2022 Preliminary Analysis, Scotsman stated that including larger condensing options could negatively affect the installation cost by efficiency level. (Scotsman, No. 30 at p. 6) Scotsman explained that some components considered as a design option may prevent the new ACIM equipment from being installed in the current location/ application. (*Id.*) Scotsman suggested that a building or installation modification may be necessary for larger products. (*Id.*) Further, Scotsman stated that some options for remote condensing applications may not be compatible with existing building rooftop structural designs. (*Id.*) Scotsman concluded by stating their concerns that these design options could negatively affect LCC or PBP. (*Id.*)

DOE's engineering analysis indicates that design options considered would not change either ACIM equipment size or weight significantly. See Engineering Analysis (section IV.C.1.b of this document) for additional discussion. Therefore, for this NOPR, DOE utilized the same installation costs for the baseline and the considered efficiency levels.

DOE received no other comments in response to the March 2022 Preliminary Analysis related to installation costs.

Therefore, in this NOPR, DOE used the same installation costs for the baseline and increased efficiency level equipment.

3. Annual Energy Consumption

For each sampled commercial building, DOE determined the energy consumption for automatic commercial ice makers at different efficiency levels using the approach described previously in section IV.E of this document.

4. Energy Prices

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

DOE derived electricity prices from the EIA energy price data by sector, by state, by provider (EIA Form 861) for average electricity price data for the commercial and industrial sectors. DOE used projections of these electricity prices for commercial and industrial consumers to estimate future energy prices in the LCC and PBP analysis. EIA's *AEO2022* was used as the source of projections for future electricity prices.

For this NOPR analysis, DOE used *AE02022* which was current for the analysis phase. However, near the time of publication of the NOPR, EIA released *AEO2023*. DOE plans to shift to *AEO2023* in the final rule analysis. A preliminary review of the electricity prices in *AEO2023* indicates lower electricity prices than *AEO2022* in the reference case. Lower electricity prices could reduce the life-cycle savings and affect the related payback period calculations. DOE will update other variables and data sets in the final rule analysis in addition to the use of *AEO2023*, as well as incorporate feedback from commenters.

DOE developed 2021 commercial retail electricity prices for each state and the District of Columbia based on EIA Form 861. To estimate energy prices in future years, DOE multiplied the 2021 energy prices by the projection of annual average price changes for each of the nine census divisions from the Reference case in *AEO2022*, which has an end year of 2050.[39] To estimate price trends after 2050, the 2041–2050 average was used for all years. DOE used EIA's 2018 Commercial Building Energy Consumption Survey (CBECS 2018) to determine the difference in commercial energy prices by building type. DOE applied the ratio of a specific building type's electricity prices to average commercial electricity prices in the LCC and PBP analysis.

DOE's methodology allows electricity prices to vary by sector, region, and building type. In the analysis, variability in electricity prices is chosen to be consistent with the way the consumer economic and energy use characteristics are defined in the LCC analysis.

DOE used a similar process to determine energy and water prices in the March 2022 Preliminary Analysis. DOE did not receive any comments related to determining energy prices in response to the March 2022 Preliminary Analysis.

See chapter 8 of the NOPR TSD for details on this analysis.

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[39] EIA. Annual Energy Outlook 2022 with Projections to 2050. Washington, DC. Available at *www.eia.gov/forecasts/aeo/* (last accessed January 24, 2023).

5. Water Prices

DOE obtained data on water and wastewater prices from the 2021 American Water Works Association (AWWA) surveys for this analysis.[40] For each state and the District of Columbia, DOE combined all individual utility observations within the state to develop one value for water and wastewater service. Because water and wastewater charges are frequently tied to the same metered commodity values, DOE combined the prices for water and wastewater into one total dollar per thousand gallons figure. This figure is referred to as the combined water price. DOE used the consumer price index (CPI) data for water related consumption (1974–2021) in developing a real growth rate for combined water price forecasts.

This approach was similar to the one DOE used to determine water prices in the March 2022 Preliminary Analysis. However, DOE updated the underlying water price data between the March 2022 Preliminary Analysis and this NOPR. DOE did not receive any comments related to water prices in in response to the March 2022 Preliminary Analysis.

Chapter 8 of the NOPR TSD provides more detail about DOE's approach to developing water and wastewater prices.

6. Maintenance and Repair Costs

Repair costs are associated with repairing or replacing components that have failed in an appliance; maintenance costs are associated with maintaining the operation of the equipment. Typically, small incremental increases in equipment efficiency entail no,

[40] Available at *engage.awwa.org/PersonifyEbusiness/Store/Product-Details/productId/103665535.*

or only minor, changes in repair and maintenance costs compared to baseline efficiency equipment.

In response to the March 2022 Preliminary Analysis seeking comment regarding repair and maintenance costs, AHRI commented that microchannel features are impossible to repair and would increase costs due to the need for replacement. AHRI also noted that portable repair is not feasible in many cases. (AHRI, No. 21 at p. 6)

DOE agrees that portable repair may be a challenge. DOE does not include repair costs in the LCC analysis for the portable low-capacity units. As a result of the lower repair rates for this equipment, DOE assumes a lower life for the portable low-capacity units.

In response to the March 2022 Preliminary Analysis, Scotsman stated that repair and maintenance costs and frequency would increase with alternative condensing options. (Scotsman, No. 30 at p. 6) Scotsman commented that increased fin configuration could result in an increase in cleaning to maintain performance. (*Id*.) Scotsman also stated that the higher cost compressors and motors would increase the acquisition cost of replacement parts. (*Id*.) Scotsman suggested that some of these design options would negatively affect LCC and PBP. (*Id*.)

DOE agrees that each of the design options could affect the LCC of the ACIM equipment. DOE used the cost of design option component and a 2.5 markup for replacement parts in the LCC analysis. The LCC and related PBP analyses reflected changes in servicing as a result of each of the design options considered.

7. Equipment Lifetime

In the January 2015 Final Rule, DOE used lifetime estimates of 8.5 years. 80 FR 4646,4700-4701. For the March 2022 Preliminary Analysis, DOE used the same lifetime estimates of 8.5 years (*see* chapter 8 of the March 2022 Preliminary Analysis TSD). DOE had requested feedback on the value of 8.5 years in the September 2020 RFI. 85 FR 60922, 60925. In response to the September 2020 ACIM RFI, AHRI and Hoshizaki both agreed that 8.5 was appropriate lifetime for all ACIM equipment classes. (AHRI, No. 4 at p.4; Hoshizaki, No. 7 at p. 3) In the March 2022 Preliminary Analysis, DOE included some additional new equipment classes than the 2015 ACIM final rule. DOE assumed a lifetime of 8.5 years for all of the equipment classes analyzed in the March 2022 Preliminary Analysis (*see* chapter 8 of the March 2022 Preliminary Analysis TSD).

In response to the March 2022 Preliminary Analysis, AHRI stated that low-capacity automatic commercial ice makers would have a shorter lifetime in residential applications / end uses. AHRI also referenced a lifetime of 7.5 years for portable ice makers that DOE assumed in the previous 2014 MREF Preliminary Analysis. (AHRI, No. 21, p. 7) DOE received no other comments related to equipment lifetime in response to either the September 2020 RFI or the March 2022 ACIM Preliminary Analysis.

In response to AHRI's comment related to other analyses, DOE reviewed the 2014 March MREF Preliminary Analysis. (Docket No. EERE-2011-BT-STD-0043, No. 24) In the 2014 March MREF Preliminary Analysis, DOE was unable to determine a definitive lifetime for low-capacity automatic ice makers because of the young age of the equipment on the market. (Docket No. EERE-2011-BT-STD-0043, No. 24 at pp. 8–14; 9–8) DOE subsequently modeled an estimate as well as used the life of residential compact freezers as a proxy for these types of ice makers. In the 2014 March MREF

Preliminary Analysis, DOE used a lifetime of both 7.5 and 8.0 years for these ice makers. (EERE-2011-BT-STD-0043, No. 43, No. 24 at pp. 8–14; 9–8)

DOE conducted additional research into icemaker lifetime in response to AHRI. Many of the components of low- and high-capacity automatic commercial ice makers will be similar or the same. Therefore, lifetime should not significantly differ between low- and high-capacity units. However, regular maintenance plays a critical role in prolonging ACIM lifetime. DOE assumes that low-capacity ice makers may not be maintained with the same frequency as high-capacity ice makers. Therefore, this NOPR analysis retains the 8.5-year lifetime for automatic commercial ice makers with a capacity of 100 lb/day and greater and a 7.5-year lifetime for equipment for commercial ice makers with a capacity lower than 100 lb/day.

See chapter 8 of the NOPR TSD for further details on the development of equipment lifetime.

8. Discount Rates

The discount rate is the rate at which future expenditures are discounted to establish their present value. In the calculation of LCC, DOE determined the discount rate by estimating the cost of capital for purchasers of automatic commercial ice makers. Most purchasers use both debt and equity capital to fund investments. Therefore, for most purchasers, the discount rate is the weighted average cost of debt and equity financing, or the weighted average cost of capital (WACC), less the expected inflation.

To estimate the WACC of automatic commercial ice maker purchasers, DOE used a sample of nearly 1,200 companies grouped to be representative of operators of each of the commercial business types (health care, lodging, foodservice, retail, education, food sales, and offices) drawn from a database of 6,177 U.S. companies presented on the Damodaran Online Data Sets. This database includes most of the publicly-traded companies in the United States. The WACC approach for determining discount rates accounts for the current tax status of individual firms on an overall corporate basis. DOE did not evaluate the marginal effects of increased costs, and, thus, depreciation due to more expensive equipment, on the overall tax status.

DOE used the final sample of companies to represent purchasers of automatic commercial ice makers. For each company in the sample, DOE combined company-specific information from the Damodaran Online Data Sets, long-term returns on the Standard & Poor's 500 stock market index, nominal long-term Federal government bond rates, and long-term inflation to estimate a WACC for each firm in the sample.

For most educational buildings and a portion of the office buildings and cafeterias occupied and/or operated by public schools, universities, and State and local government agencies, DOE estimated the cost of capital based on a 40-year geometric mean of an index of long-term tax-exempt municipal bonds (≤20 years). Federal office space was assumed to use the Federal bond rate, derived as the 40-year geometric average of long-term (≤10 years) U.S. government securities.

DOE used the same approach to determine discount rates for the March 2022 Preliminary Analysis. DOE did not receive any comments related to discount rates in relation to the March 2022 Preliminary Analysis.

See chapter 8 of the NOPR TSD for further details on the development of consumer discount rates.

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

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

To estimate the energy efficiency distribution of automatic commercial icemakers for 2027 (first year of the analysis period), DOE conducted general internet searches and examined manufacturer literature to understand the characteristics of the ice makers currently offered on the market. The estimated market shares for the no-new-standards case for automatic commercial ice makers are shown in Table IV.10. The efficiency level distribution values were developed by a review of the CCD.[41] DOE sorted the portion of equipment in CCD that corresponds with energy use values from the engineering analysis. For equipment classes not listed in CCD, DOE assumed an even distribution among the efficiency levels analyzed.

[41] Department of Energy–Office of Energy Efficiency and Renewable Energy. *U.S. Department of Energy's Compliance Certification Database*. Available at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A* (Ice Makers – Automatic Commercial).*

Table IV.10 Efficiency Level Distribution Within Each Equipment Class in No-New-Standards Case for Automatic Commercial Ice Makers

Equipment Class	EL 0	EL 1	EL 2	EL 3	EL 4	EL 5	EL 6	EL 7
B-IMH-W (≥300 and <785)	37%	11%	0%	52%	0%	0%	0%	0%
B-IMH-W (≥785 and <1,500)	66%	21%	0%	13%	0%	0%	0%	0%
B-IMH-A (≥300 and <727)	24%	0%	12%	0%	30%	0%	34%	0%
B-IMH-A (≥727 and <1,500)	84%	1%	10%	0%	3%	0%	1%	0%
B-RC(NRC)-A (≥988 and <4,000)	20%	0%	36%	0%	0%	0%	43%	0%
B-SC-A (Portable ACIM) (≤38)	67%	11%	11%	11%	0%	0%	0%	0%
B-SC-A (Refrigerated Storage ACIM)	82%	6%	6%	6%	0%	0%	0%	0%
B-SC-A (<=50)	30%	10%	10%	10%	10%	10%	10%	10%
B-SC-A (>50 and <134)	71%	2%	2%	2%	2%	0%	22%	0%
B-SC-A (≥200 and <4,000)	91%	0%	0%	0%	4%	0%	4%	0%
C-IMH-W (>50 and <801)	91%	0%	9%	0%	0%	0%	0%	0%
C-IMH-A (≥310 and <820)	40%	2%	18%	5%	0%	35%	0%	0%
C-RC&RC-A (≥800 and <4,000)	50%	17%	0%	0%	0%	33%	0%	0%
C-SC-A (>50 and <149)	92%	0%	0%	0%	0%	8%	0%	0%
C-SC-A (≥149 and <700)	71%	0%	18%	0%	0%	10%	0%	0%

The LCC Monte Carlo simulations draw from the efficiency distributions and randomly assign an efficiency to the automatic commercial ice makers purchased by each sample buildings in the no-new-standards case. The resulting percent shares within the sample match the market shares in the efficiency distributions.

The efficiency level distribution described here is the same approach used in the March 2022 Preliminary Analysis.

In response to the March 2022 Preliminary Analysis, Scotsman commented that manufacturers are implementing new refrigerants into refrigerant systems capable of making and harvesting ice as result of efforts by EPA related to HFC refrigerants. Scotsman stated that this change in refrigerants would create a dynamic efficiency distribution until 2036. (Scotsman, No. 30 at p. 8) AHRI and Hoshizaki commented that due to changing refrigerants required under existing EPA regulations, they do not believe that efficiency distributions will be fixed in the next several years. (AHRI, No. 21 at p. 8; Hoshizaki, No. 20 at p. 4) Both AHRI and Hoshizaki stated that different refrigerants offer different performance and efficiency changes that could affect how a particular company or equipment class achieves energy savings, and it is difficult for them to predict exactly how efficiency trends will change without completing additional ice maker performance testing and research because this industry is still early in its transition to alternative refrigerants. (*Id.*) AHRI noted also that market distributions for equipment are difficult to ascertain in light of the fact that A2Ls and A1s will take time to be approved by EPA. (AHRI, No. 21 at p. 5)

DOE agrees that manufacturers are shifting in the use of refrigerants and this shift directly affects the efficiency distributions. In this NOPR, DOE shifted the baseline in many of equipment classes to incorporate refrigerants. See engineering analysis (section IV.C of this document). As a result of the shift in engineering, DOE reformulated the efficiency distributions from the March 2022 Preliminary Analysis by utilizing the same process of sorting from CCD. In the March 2022 Preliminary Analysis, DOE's engineering included baseline and efficiency levels below the efficiency correlated with the use of refrigerant. In this NOPR, DOE rolled up all the distribution to this new refrigerant baseline. Distribution of equipment above this refrigerant baseline was relatively unchanged compared to the March 2022 Preliminary Analysis. However, DOE did reconstitute the steps between efficiency levels in this NOPR. As a result of the new energy use values associated with the ELs, the efficiency distribution was reformulated in this NOPR because of the revised engineering analysis in this NOPR.

AHRI commented that they are unable to accurately comment on the proposed low-capacity efficiency distributions without better understanding examples of equipment that would be covered in scope to compare and validate data from the other classes of previously regulated automatic commercial ice makers and provide accurate data to DOE. (AHRI, No. 21 at pp. 5–6)

In relation to a request about market share distributions by efficiency levels for each equipment class and representative units, Scotsman stated that ice makers with production capacities under 50 pounds per day (also known as low-capacity ACIM equipment in this NOPR) should not be considered. (Scotsman, No. 30 at p. 5)

DOE acknowledges the comment by Scotsman, but the comment does not relate to efficiency distributions methodology or values. DOE addresses this comment elsewhere in this NOPR (*see* section III.B of this document).

DOE did not receive any comments related to using CCD to determine efficiency level distributions in response to the March 2022 Preliminary Analysis.

See chapter 8 of the NOPR TSD for further information on the derivation of the efficiency distributions.

10. Payback Period Analysis

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

The inputs to the PBP calculation for each efficiency level are the change in total installed cost of the equipment and the change in the first-year annual operating expenditures relative to the baseline. DOE refers to this as a "simple PBP" because it does not consider changes over time in operating cost savings. The PBP calculation has one difference from the LCC analysis, in that the PBP calculation does not include repair costs because they do not necessarily take place in the first year of equipment operation.

As noted previously, EPCA establishes a rebuttable presumption that a standard is economically justified if the Secretary finds that the additional cost to the consumer of purchasing equipment 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. 6316(a); 42 U.S.C. 6295(o)(2)(B)(iii)) For each considered efficiency level, DOE determined the value of the first year's energy savings by calculating the energy savings in accordance with the applicable DOE test procedure, and multiplying those savings by the average energy price projection for the year in which compliance with the amended standards would be required.

G. Shipments Analysis

DOE uses projections of annual equipment shipments to calculate the national impacts of potential amended or new energy conservation standards on energy use, NPV, and future manufacturer cash flows.[42] The shipments model takes an accounting approach, tracking market shares of each equipment class and the vintage of units in the stock. Stock accounting uses equipment shipments as inputs to estimate the age distribution of in-service product stocks for all years. The age distribution of in-service

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[42] 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.

equipment stocks is a key input to calculations of both the NES and NPV, because operating costs for any year depend on the age distribution of the stock.

In response to the March 2022 Preliminary Analysis, AHRI stated that shipments of equipment will also be limited by refrigerant charge in all jurisdictions within the United States. (AHRI, No. 21 at p. 8)

DOE agrees that refrigerant use by manufacturers is changing (but not related to this rule) and that use may affect shipments. In this NOPR, DOE modeled a new efficiency distribution with a refrigerant change in the baseline for most equipment classes compared to the March 2022 Preliminary Analysis. However, DOE does not agree that the total shipment volume in the future will decrease as a result of the refrigerant changes that are occurring in the ACIM industry.

In response to the March 2022 Preliminary Analysis, NAFEM requested DOE provide further information about how the economic situation since 2020 has been incorporated into its assumptions and calculations. (NAFEM, No. 19 at p. 3) NAFEM stated that, as they understand the analysis presented in Section 9 of the March 2022 Preliminary TSD, historical information was used to develop future forecasting, and that the information does not take in account the lower shipment levels experienced in 2020 and 2021 and the continued supply chain issues that challenge part availability. (*Id.*)

DOE's analysis period starts in 2027. DOE projects that ACIM shipments will return to a similar pre-2020/2021 volume by 2027.

In addition, DOE received several comments in response to the March 2022 Preliminary Analysis regarding shipments projections of low-capacity ACIM equipment.

Scotsman stated that any total market shipment calculations should exclude low-capacity ACIM equipment. (Scotsman, No. 30 at p. 8) AHRI stated that domestic refrigerators with ice makers should not be considered part of the analysis. (AHRI, No. 21 at p. 8)

DOE disagrees with Scotsman's and AHRI's comments. DOE addressed the scope of coverage and low-capacity ACIM equipment previously in this NOPR (*see* section III.B of this document).

AHRI commented that new classes being the largest market share should drive DOE to perform a more complete analysis. (AHRI, No. 21 at p. 9) AHRI recommended that DOE pull in information from the AHAM to help update its analysis. (*Id*. at p. 8) AHAM and the CA IOUs commented that DOE's estimated shipment calculations (76.89 share) for low-capacity equipment was likely too high. (AHAM, No. 27 at p. 10; CA IOUs, No. 18 at pp. 1–3)

DOE's March 2022 Preliminary Analysis shipments model did not include a fixed percentage for low-capacity ACIM shipments. Shipments for major types of automatic commercial ice makers (*e.g.*, continuous, batch, low-capacity ACIM equipment) were developed from research and other analyses. Data gathered during the manufacturer impact analysis interviews contradict comments that low-capacity ACIM shipments in the March 2022 Preliminary Analysis were likely too high.

Whirlpool commented that the energy savings potential of low-capacity ACIM equipment (Whirlpool referred to them as residential ice makers) is greatly over-exaggerated due to the low annual shipments of these products. (Whirlpool, No. 26 at p. 3) Whirlpool stated these are niche products in the U.S. market, and nowhere close to a majority of households own one of these appliances, therefore the national energy savings potential will be small from such a low number of annual shipments. (*Id.* at pp. 3–4)

Shipments modeled in the March 2022 Preliminary Analysis for low-capacity ACIM equipment were based on previous DOE analysis. In response to the September 2020 RFI, DOE received a joint comment from ASAP, NRDC, and NEEA about low-capacity ACIM equipment. The Joint Commenters referenced the 2014 March MREF Preliminary Analysis TSD conducted by DOE. (*See* EERE-2011-BT-STD-0043) This analysis estimated a stock of 5.5 million low-capacity automatic commercial ice makers and estimated 800,000 units shipped in 2021. (Joint Commenters No. 5, pp. 4–5).

In response to the March 2022 Preliminary Analysis, NAFEM commented that DOE data received for shipments was not from manufacturers and overestimated the shipment totals for low-capacity ice makers. (NAFEM, No. 19 at p. 2) AHRI also commented that they understand that these shipment values came from the 2014 March MREF Preliminary Analysis TSD (EERE-2011-BT-STD-0043) that was refuted by data shared by AHAM. (AHRI, No. 21 at p. 8)

AHRI and Hoshizaki commented that DOE market data should be compared with the AHRI and AHAM market data and reviewed for accuracy. (AHRI, No. 21 at p. 8; Hoshizaki, No. 20 at p. 4) AHRI and Hoshizaki stated that portable ice makers are not sold by many ACIM manufacturers, so they are concerned that the analysis shows that category alone has higher shipments than all the other categories combined. (*Id.*)

AHAM commented that when compared to shipments for other core major appliances—the "AHAM 6," which includes clothes washers, clothes dryers, dishwashers, refrigerators, freezers, and ranges and ovens—it is clear that residential stand-alone ice makers that make clear ice make up a tiny fraction of appliance shipments. (AHAM, No. 27 at p. 9) AHAM provided also a table demonstrating the proportion of AHAM residential ice maker shipments to the AHAM 6 shipments. (*Id.*)

Additionally, AHAM commented that the trends are different for shipments of residential ice makers as opposed to the AHAM 6. (AHAM, No. 27 at p. 10) AHAM stated that residential ice makers experienced a significantly higher reduction in shipments than the AHAM 6 from 2018-2020. (*Id.*)

Hoshizaki commented that, during the May 5, 2022, public meeting (*see* Public Meeting Transcript, No. 25), it was noted that the assumptions were from a comment in 2014 during an ASRAC meeting. (Hoshizaki, No. 20 at p. 3) Hoshizaki commented that they would like the opportunity to review the transcript from the webinar along with answers to questions asked during the webinar to give full analysis of this area. (*Id.*)

Whirlpool also agreed with the conclusion presented by AHAM that standards for low-capacity automatic commercial ice makers would likely not be justified anyway, even if such equipment was included in the scope of the ACIM rulemaking, due to very low annual shipments industry-wide. (Whirlpool, No. 26 at p. 2) AHAM commented that even including low-capacity ACIM equipment under the scope of the ACIM equipment category does not justify standards for these low-volume, infrequently and intermittently-used products. (AHAM, No. 27 at p. 2)

For this NOPR, DOE included data from manufacturer impact analysis interviews to refine the shipments model. Data gathered during the manufacturer impact analysis interviews contradict comments that low-capacity ACIM shipments in the March 2022

Preliminary Analysis were too voluminous. Per the data gathered in the manufacturer impact analysis interviews, low-capacity ACIM shipments represent a large portion of the shipments in the NOPR shipments projections.

Beyond the total volume of low-capacity ACIM equipment shipments, the CA IOUs commented that the distribution amount equipment classes within those shipments, that the shipments should not be evenly distributed across the three equipment classes. (CA IOUs, No. 18 at pp. 2–3)

DOE agrees that each of the low-capacity ACIM equipment classes should not be evenly distributed. In the shipments model for this NOPR, DOE modeled each of the low-capacity ACIM equipment classes at different distribution, with the portable ACIM equipment class quite larger than the other two equipment classes. DOE based this distribution on research, as well as data gathered during manufacturer impact analysis interviews.

H. National Impact Analysis

The NIA assesses the NES and the NPV from a national perspective of total consumer costs and savings that would be expected to result from new or amended standards at specific efficiency levels.[43] ("Consumer" in this context refers to consumers of the equipment being regulated.) DOE calculates the NES and NPV for the potential standard levels considered based on projections of annual equipment shipments, along with the annual energy consumption and total installed cost data from the energy use and LCC analyses. For the present analysis, DOE projected the energy savings, operating

[43] The NIA accounts for impacts in the 50 states and U.S. territories.

cost savings, product costs, and NPV of consumer benefits over the lifetime of automatic commercial ice makers sold from 2027 through 2056.

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

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

Table IV.11 summarizes the inputs and methods DOE used for the NIA analysis for this NOPR. Discussion of these inputs and methods follows the table. See chapter 10 of the NOPR TSD for further details.

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

Inputs	Method
Shipments	Annual shipments from shipments model.
Compliance Date of Standard	2027
Efficiency Trends	No-new-standards case: Constant over time Standards cases: Constant over time roll-up
Annual Energy Consumption per Unit	Annual weighted-average values are a function of energy use at each TSL.
Total Installed Cost per Unit	Annual weighted-average values are a function of cost at each TSL. Incorporates projection of future product prices based on historical data.
Annual Energy Cost per Unit	Annual weighted-average values as a function of the annual energy consumption per unit and energy prices.
Repair and Maintenance Cost per Unit	Annual values do not change with efficiency level.
Energy Price Trends	*AEO2022* projections (to 2050) and extrapolation thereafter.
Energy Site-to-Primary and FFC Conversion	A time-series conversion factor based on *AEO2022*.
Discount Rate	3 percent and 7 percent
Present Year	2022

1. Equipment Efficiency Trends

A key component of the NIA is the trend in energy efficiency projected for the no-new-standards case and each of the standards cases. Section IV.F.9 of this document describes how DOE developed an energy efficiency distribution for the no-new-standards case (which yields a shipment-weighted average efficiency) for each of the considered equipment classes for the year of anticipated compliance with an amended or new standard. To project the trend in efficiency absent amended standards for automatic commercial ice makers over the entire shipments projection period, DOE assumed the initial efficiency distribution would remain constant over the analysis period. The approach is further described in chapter 10 of the NOPR TSD.

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

2. National Energy Savings

The national energy savings analysis involves a comparison of national energy consumption of the considered products between each potential standards case (TSL) and the case with no new or amended energy conservation standards. DOE calculated the national energy consumption by multiplying the number of units (stock) of each equipment (by vintage or age) by the unit energy consumption (also by vintage). DOE calculated annual NES based on the difference in national energy consumption for the no-new standards case and for each higher efficiency standard case. DOE estimated energy consumption and savings based on site energy and converted the electricity consumption and savings to primary energy (*i.e.*, the energy consumed by power plants to generate site electricity) using annual conversion factors derived from *AEO2022*. Cumulative energy savings are the sum of the NES for each year over the timeframe of the analysis.

Use of higher-efficiency equipment is sometimes associated with a direct rebound effect, which refers to an increase in utilization of the equipment due to the increase in efficiency. DOE did not find any data on the rebound effect specific to automatic commercial ice makers. Therefore, DOE did not include rebound effect in the NPV analysis.

DOE requests comments on its approach to monetizing the impact of the rebound effect.

In 2011, in response to the recommendations of a committee on "Point-of-Use and Full-Fuel-Cycle Measurement Approaches to Energy Efficiency Standards" appointed by the National Academy of Sciences, DOE announced its intention to use

FFC measures of energy use and greenhouse gas and other emissions in the national impact analyses and emissions analyses included in future energy conservation standards rulemakings. 76 FR 51281 (Aug. 18, 2011). After evaluating the approaches discussed in the August 18, 2011 notice, DOE published a statement of amended policy in which DOE explained its determination that EIA's National Energy Modeling System (NEMS) is the most appropriate tool for its FFC analysis and its intention to use NEMS for that purpose. 77 FR 49701 (Aug.17, 2012). NEMS is a public domain, multi-sector, partial equilibrium model of the U.S. energy sector[44] that EIA uses to prepare its *Annual Energy Outlook*. The FFC factors incorporate losses in production and delivery in the case of natural gas (including fugitive emissions) and additional energy used to produce and deliver the various fuels used by power plants. The approach used for deriving FFC measures of energy use and emissions is described in appendix 10B of the NOPR TSD.

In response to the March 2022 Preliminary Analysis, AHAM commented that the national energy savings are trivial according to DOE's analysis even using what AHAM believes are overestimated savings. (AHAM, No. 27 at p. 13) AHAM added that, per the March 2022 Preliminary Analysis, energy savings are below 0.5 quads for all equipment classes and range from 0.014–0.121 quads for the newly proposed low-capacity equipment classes at efficiency levels 1–5. (*Id.*) AHAM stated that these savings are not sufficient to justify the significant burden and cost that manufacturers would incur to meet and demonstrate compliance with the new standards or potential loss of consumer utility. (*Id.*)

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[44] For more information on NEMS, refer to *The National Energy Modeling System: An Overview 2009*, DOE/EIA-0581(2009), October 2009. Available at *www.eia.gov/outlooks/aeo/nems/overview/index.html* (last accessed January 17, 2023).

DOE disagrees with AHAM that the savings are overestimated. This NOPR uses additional data and analyses to refine the national energy savings values and benefits to the nation presented in the March 2022 Preliminary Analysis. DOE addresses the significance and national benefits from these savings in section V in this document.

Whirlpool stated residential ice makers are a niche product in the U.S. market, and nowhere close to a majority of households own one of these appliances, and therefore the national energy savings potential will be small from such a low number of annual shipments. (Whirlpool, No. 26 at pp. 3–4)

DOE disagrees with Whirlpool's comment that the NES for low capacity automatic commercial ice makers would be small. As discussed in section IV.G of this document, DOE received low-capacity ACIM equipment shipment data during the manufacturer impact analysis interviews. The data received contradicts Whirlpool's comment that the low-capacity ACIM equipment shipments are "a low number." The national energy savings presented in this NOPR for low-capacity ACIM equipment are based on the shipment volume DOE gathered as part of the MIA interviews.

The NIA in this document presents the national energy savings. Section V of this document discusses the results and conclusions using the national energy savings from the NIA.

3. Net Present Value Analysis

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

As discussed in sections IV.F.1 and IV.H.3 of this document, DOE analyzed ACIM price trends based on historical Producer Price Index (PPI) data. PPI data were deflated using implicit gross domestic product (GDP) deflators and found to be constant on average. Although prices for overall ACIM equipment were constant, DOE also developed component price trends for ECMs using historical PPI data for semiconductors and related devices. Efficiency levels that include ECMs have price learning applied to the semiconductor related portion of the MSP. DOE found that prices for semiconductors related components decreased by 5.88 percent annually. DOE's projection of price trends is described in chapter 8 of the NOPR TSD.

The energy cost savings are calculated using the estimated energy savings in each year and the projected price of the appropriate form of energy. To estimate energy prices in future years, DOE multiplied the average regional energy prices by the projection of annual national-average commercial energy price changes in the Reference case from *AEO2022*, which has an end year of 2050. To estimate price trends after 2050, the 2046–2050 average was used for all years. As part of the NIA, DOE also analyzed scenarios that used inputs from variants of the *AEO2022* Reference case that have lower and higher economic growth. Those cases have lower and higher energy price trends compared to the Reference case.

In calculating the NPV, DOE multiplies the net savings in future years by a discount factor to determine their present value. For this NOPR, DOE estimated the NPV of consumer benefits using both a 3-percent and a 7-percent real discount rate. DOE uses these discount rates in accordance with guidance provided by the Office of Management and Budget (OMB) to Federal agencies on the development of regulatory analysis.[45] 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.

In the March 2022 Preliminary Analysis, DOE requested comments about scaling between representative and non-representative equipment classes. DOE requested comment on the approach of estimating energy use and cost of non-representative equipment classes (*see* Executive Summary of the March 2022 Preliminary Analysis TSD). In response, Scotsman stated that DOE's analysis includes low-capacity ACIM equipment, which should not be considered in this rulemaking. (Scotsman, No. 30 at p. 9)

DOE notes that this comment is not on the methodology of scaling between representative and non-representative units. DOE addresses the addition of low-capacity ACIM equipment to the scope of this proposed rulemaking earlier in this NOPR (*see* section III.B of this document).

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[45] United States Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. Section E. Available at *georgewbush-whitehouse.archives.gov/omb/memoranda/m03-21.html* (last accessed January 13, 2023

Scotsman commented that energy use values cannot be scaled for low-capacity ACIM equipment from large capacity equipment. (Scotsman, No. 30 at p. 9)

DOE agrees that low-capacity ACIM equipment energy use (and thus energy savings) cannot be scaled from large capacity equipment. As stated earlier, DOE determined the energy use for low-capacity ACIM equipment based on the engineering analyses for those individual equipment classes. However, DOE does scale between batch and continuous low-capacity ACIM equipment classes.

I. Consumer Subgroup Analysis

In analyzing the potential impact of new or amended energy conservation standards on consumers, DOE evaluates the impact on identifiable subgroups of consumers that may be disproportionately affected by a new or amended national standard, such as different types of businesses that may be disproportionately affected. The purpose of a subgroup analysis is to determine the extent of any such disproportional impacts. DOE evaluates impacts on particular subgroups of consumers by analyzing the LCC impacts and PBP for those particular consumers from alternative standard levels. For this NOPR, DOE analyzed the impacts of the considered standard levels on two subgroups: (1) the lodging sector and (2) the foodservice sector. The analysis used subsets of the 2018 CBECS sample composed of consumers that meet the criteria for the two subgroups. DOE used the LCC and PBP spreadsheet model to estimate the impacts of the considered efficiency levels on these subgroups.

In the March 2022 Preliminary Analysis, DOE requested comment on the use of different consumer subgroups used in the analysis.

In response to the March 2022 Preliminary Analysis, AHRI commented that new equipment categories change the distribution channels and buying patterns compared to more traditional ACIM equipment, and that DOE should analyze these sets of consumers differently. (AHRI, No. 21 at p. 9) AHRI stated that behaviors and use cases of low-capacity (residential) consumers are different, and that equipment run time/duty cycle would differ greatly. (*Id.*) AHRI commented that residential ice makers may have a lower utilization than higher capacity ACIM equipment. (*Id.*) Therefore, AHRI stated that DOE's analysis should not assume that use of new categories is the same as currently regulated equipment. (*Id.*)

DOE agrees that each equipment class and efficiency level is unique and should be analyzed per the applicable aspects (*e.g.*, water, energy, maintenance) to that equipment class. As discussed in section IV.E of this document, DOE already analyzes the operational characteristics of low-capacity ACIM equipment differently than large-capacity ACIM equipment. The NIA is conducted the same for each equipment class.

Based on the data available to DOE, ACIM ownership in two building types represents over 30 percent of the market: foodservice and hotels. In general, the lower the cost of electricity and higher the cost of capital, the more likely it is that an entity would be disadvantaged by the requirement to purchase higher efficiency equipment. Chapter 8 of the NOPR TSD presents the electricity price by business type and discount rates by building types, respectively, while chapter 11 discusses these topics as they specifically relate to the subgroups.

Comparing the foodservice and lodging categories, the two sectors face similarly high energy prices. With foodservice facing a higher cost of capital, foodservice was selected for subgroup analysis because the higher cost of capital should lead foodservice customers to value first cost more and future electricity savings less than would be the case for food sales customers.

DOE estimated the impact on the identified consumer subgroups using the LCC spreadsheet model. The standard LCC and PBP analyses (described in section IV.G) include various types of businesses that use automatic commercial ice makers. For the consumer subgroup analysis, it was assumed that the subgroups analyzed do not have access to national purchasing accounts or to major capital markets, thereby making the discount rates higher for these subgroups.

Chapter 11 in the NOPR TSD describes the consumer subgroup analysis.

J. Manufacturer Impact Analysis

1. Overview

DOE performed an MIA to estimate the financial impacts of amended energy conservation standards on manufacturers of automatic commercial ice makers and to estimate the potential impacts of such standards on employment and manufacturing capacity. The MIA has both quantitative and qualitative aspects and includes analyses of projected industry cash flows, the INPV, investments in research and development (R&D) and manufacturing capital, and domestic manufacturing employment. Additionally, the MIA seeks to determine how amended energy conservation standards might affect manufacturing 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 GRIM, an industry cash flow model with inputs specific to this rulemaking. The key GRIM inputs include data on the industry cost structure, unit production costs, product shipments, manufacturer markups, and investments in R&D and manufacturing capital required to produce compliant products. The key GRIM outputs are the INPV, which is the sum of industry annual cash flows over the analysis period, discounted using the industry-weighted average cost of capital, and the impact to domestic manufacturing employment. The model uses standard accounting principles to estimate the impacts of more-stringent energy conservation standards on a given industry by comparing changes in INPV and domestic manufacturing employment between a no-new-standards case and the various standards cases. To capture the uncertainty relating to manufacturer pricing strategies following amended standards, the GRIM estimates a range of possible impacts under different manufacturer markup scenarios.

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

DOE conducted the MIA for this rulemaking in three phases. In Phase 1 of the MIA, DOE prepared a profile of the ACIM equipment manufacturing industry based on the market and technology assessment, preliminary manufacturer interviews, and publicly-available information. This profile included an analysis of ACIM equipment manufacturers that DOE used to derive preliminary financial inputs for the GRIM (*e.g.*, revenues; materials, labor, overhead, and depreciation expenses; selling, general, and administrative expenses (SG&A); and R&D expenses). DOE also used public sources of information to further calibrate its initial characterization of the ACIM equipment manufacturing industry, including company filings of form 10-K from the SEC,[46] corporate annual reports, the U.S. Census Bureau's *ASM*,[47] the U.S. Census Bureau's *Economic Census,*[48] the U.S. Census Bureau's *Quarterly Survey of Plant Capacity Utilization*,[49] and reports from Dun & Bradstreet.[50]

In Phase 2 of the MIA, DOE prepared a framework industry cash-flow analysis to quantify the potential impacts of new or amended energy conservation standards. The GRIM uses several factors to determine a series of annual cash flows starting with the announcement of the standard and extending over a 30-year period following the compliance date of the standard. These factors include annual expected revenues, costs of sales, SG&A and R&D expenses, taxes, and capital expenditures. In general, energy conservation standards can affect manufacturer cash flow in three distinct ways: (1) creating a need for increased investment, (2) raising production costs per unit, and (3) altering revenue due to higher per-unit prices and changes in sales volumes.

In addition, during Phase 2, DOE developed interview guides to distribute to manufacturers of automatic commercial ice makers in order to develop other key GRIM inputs, including product and capital conversion costs, and to gather additional

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[46] U.S. Securities and Exchange Commission. *Electronic Data Gathering, Analysis, and Retrieval system*. Available at *www.sec.gov/edgar/searchedgar/companysearch.html* (last accessed December 14, 2022).
[47] U.S. Census Bureau. *Annual Survey of Manufactures*. (2013–2022). Available at *www.census.gov/programs-surveys/asm.html* (last accessed February 1, 2023).
[48] U.S. Census Bureau. *Economic Census*. (2012 and 2017). Available at *www.census.gov/programs-surveys/economic-census.html* (last accessed February 1, 2023).
[49] U.S. Census Bureau. *Quarterly Survey of Plant Capacity Utilization*. (2010–2022). Available at *www.census.gov/programs-surveys/qpc/data/tables.html* (Last accessed December 14, 2022).
[50] Dun & Bradstreet Hoovers. Subscription login accessible at *app.dnbhoovers.com/* (last accessed December 14, 2022).

information on the anticipated effects of energy conservation standards on revenues, direct employment, capital assets, industry competitiveness, and subgroup impacts.

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

2. Government Regulatory Impact Model and Key Inputs

DOE uses the GRIM to quantify the changes in cash flow due to amended standards that result in a higher or lower industry value. The GRIM uses a standard, annual discounted cash-flow analysis that incorporates manufacturer costs, manufacturer markups, shipments, and industry financial information as inputs. The GRIM models changes in costs, distribution of shipments, investments, and manufacturer margins that could result from a new or amended energy conservation standard. The GRIM spreadsheet uses the inputs to arrive at a series of annual cash flows, beginning in 2023 (the base year of the analysis) and continuing to 2056. DOE calculated INPVs by summing the stream of annual discounted cash flows during this period. For manufacturers of automatic commercial ice makers, DOE used a real discount rate of 9.2 percent, which was derived from industry financials and then modified according to feedback received during manufacturer interviews.

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

a. Manufacturer Production Costs

Manufacturing more efficient equipment is typically more expensive than manufacturing baseline equipment due to the use of more complex components, which are typically more costly than baseline components. The changes in the MPCs of equipment can affect the revenues, gross margins, and cash flow of the industry. For a complete description of the MPCs, see section IV.C.3 of this document or chapter 5 of the NOPR TSD.

b. Shipments Projections

The GRIM estimates manufacturer revenues based on total unit shipment projections and the distribution of those shipments by efficiency level. Changes in sales volumes and efficiency mix over time can significantly affect manufacturer finances. For this analysis, the GRIM uses the NIA's annual shipment projections derived from the shipments analysis from 2023 (the NOPR publication year) to 2056 (the end year of the analysis period). See section IV.G of this document or chapter 9 of the NOPR TSD for additional details.

c. Product and Capital Conversion Costs

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

DOE based its estimates of the product conversion costs that would be required to meet each efficiency level on information obtained from manufacturer interviews, the design pathways analyzed in the engineering analysis, market share estimates, and model count information. DOE assigned estimates for the total product development required for each design option based on the necessary engineering, technician, and marketing resources required to implement each design option for a basic model. DOE assumed changes to condenser design (*i.e.*, switching from tube and fin to microchannel or increasing the size of the condenser) would require more complex system redesigns as compared to implementing more efficient components (*e.g.*, implementing a PSC motor or an ECM).

To estimate industry product conversion costs, DOE multiplied the product development estimate at each efficiency level for each equipment class by the number of industry basic models that would require redesign. DOE used its CCD,[51] California Energy Commission's Modernized Appliance Efficiency Database System (MAEDbS),[52] AHRI's Directory of Certified Product Performance,[53] and EPA's ENERGY STAR Product Finder dataset[54] to identify ACIM models covered by this proposed rulemaking. To identify low-capacity automatic commercial ice makers, DOE expanded on the database used for the March 2022 Preliminary Analysis with publicly available data aggregated from web scraping retail websites. DOE used the efficiency distribution of the shipments analysis to estimate the model efficiency distribution. DOE also considered the estimated testing cost to test the DOE test procedure for low-capacity basic models as detailed in the November 2022 Test Procedure Final Rule. 87 FR 65856, 65894. Low-capacity ACIMs are not currently subject to DOE testing or energy conservation standards. Manufacturers will not be required to test low-capacity ACIMs

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[51] U.S. Department of Energy's Compliance Certification Database is available at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A** (last accessed November 28, 2022).

[52] California Energy Commission's Modernized Appliance Efficiency Database System is available at *cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx* (last accessed November 28, 2022).

[53] Air Conditioning, Heating, and Refrigeration Institute's Directory of Certified Product Performance is available at *www.ahridirectory.org/Search/SearchHome?ReturnUrl=%2f* Last accessed November 28, 2022).

[54] U.S. Environmental Protection Agency's ENERY STAR Product Finder dataset is available at *www.energystar.gov/productfinder/* (last accessed November 17, 2022).

until such time as the compliance date for any newly established energy conservation standards for such equipment. In the November 2022 Test Procedure Final Rule, DOE estimated that the amended test procedure has a per-test cost of $4,700, and that testing two basic models for certification purposes would have a total cost of $9,400. *Id*. at 65894.

DOE also estimated the capital conversion costs manufacturers would incur to comply with potential new or amended energy conservation standards using information from manufacturer interviews, the engineering analysis, the shipments analysis, and OEM counts. During interviews, manufacturers provided estimates and descriptions of the required tooling changes that would be necessary to upgrade basic models to implement the various design options. Based on these inputs, DOE assumed that most component changes, while requiring moderate product conversion costs, would not require changes to existing production lines and equipment, and therefore not require notable capital expenditures because one-for-one component swaps would not require changes to existing production equipment. However, based on feedback, DOE modeled higher tooling costs when manufacturers would have to implement new condenser designs. To estimate industry capital conversion costs, DOE scaled the estimated capital expenditures at each efficiency level for each equipment class by the number of OEMs without any compliant basic models.

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

d. Manufacturer Markup Scenarios

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

Under the preservation of gross margin percentage scenario, DOE applied a single uniform "gross margin percentage" markup across all efficiency levels, which assumes that manufacturers would be able to maintain the same amount of profit as a percentage of revenues at all efficiency levels within a product class. As manufacturer production costs increase with efficiency, this scenario implies that the per-unit dollar profit will increase. DOE assumed a gross margin percentage of 20 percent for all equipment classes.[55] Manufacturers tend to believe it is optimistic to assume that they would be able to maintain the same gross margin percentage as their production costs increase, particularly for minimally efficient products. Therefore, this scenario represents an upper bound of industry profitability under a new or amended energy conservation standard.

[55] The gross margin percentage of 20 percent is based on a manufacturer markup of 1.25.

In the preservation of operating profit scenario, as the cost of production goes up under a standards case, manufacturers are generally required to reduce their manufacturer markups to a level that maintains no-new-standards case operating profit. DOE implemented this scenario in the GRIM by lowering the manufacturer markups at each TSL to yield approximately the same earnings before interest and taxes in the standards case as in the no-new-standards case in the year after the expected compliance date of the new or amended standards. The implicit assumption behind this scenario is that the industry can only maintain its operating profit in absolute dollars after the standard takes effect.

A comparison of industry financial impacts under the two scenarios is presented in section V.B.2.a of this document.

3. Manufacturer Interviews

DOE interviewed manufacturers representing approximately 69 percent of domestic covered ACIM shipments and 57 percent of the proposed expanded scope shipments. Participants included domestic-based and foreign-based OEMs as well as importers. Participants included manufacturers with a wide range of market shares and a variety of equipment class offerings.

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

a. Refrigerant Regulation

Nearly all manufacturers expressed concerns about their ability to meet more stringent energy conservation standards and comply with refrigerant regulation limiting the use of HFC and high-GWP refrigerants. First, manufacturers expressed concern about the regulatory uncertainty surrounding the transition to low-GWP refrigerants. During interviews, manufacturers could only speculate on the likely direction and timeline of Federal ACIM equipment-specific refrigerant regulation. While manufacturers indicated that they had or were planning to transition a portion of their smaller-capacity automatic commercial ice makers to R-290 or R-600a, manufacturers were less certain about the paths forward for remote equipment classes and larger-capacity automatic commercial ice makers (*i.e.*, models that would exceed the current EPA R-290 charge limit of 150 grams). Most manufacturers indicated that they would transition more models to R-290 should EPA update the charge limit to 500 grams in alignment with industry safety standards. However, these manufacturers also indicated that they would wait for EPA approval prior to transitioning these larger-capacity models to R-290.

Second, manufacturers noted that there is technical uncertainty about the performance of alternative refrigerants and their impact on automatic commercial ice maker reliability and efficiency. Particularly for refrigerants other than R-290 and R-600a, manufacturers had limited data to assess the impacts on performance and efficiency. Some manufacturers tested refrigerants that caused an increase in energy consumption, indicating that additional development would be necessary just to get to the current DOE minimum efficiency standards. Furthermore, manufacturers noted that there were limited compressor options for certain alternative refrigerants.

Third, manufacturers stated that transitioning automatic commercial ice makers to make use of alternative refrigerants, particularly flammable refrigerants (*e.g.*, R-290, R-600a), requires a significant amount of engineering resources and capital investment. Nearly all manufacturers expressed concern that they would have neither the time nor the resources to complete the dual development necessary to comply with stringent DOE energy conservation standards and EPA regulations over a short time period. Some manufacturers noted that spacing out the compliance dates for potential standards and refrigerant regulations would reduce the cumulative regulatory burden. For example, some manufacturers suggested that requiring a 5-year compliance period instead of a 3-year compliance period would allow manufacturers time to spread out the R&D and capital costs. Depending on when compliance would be required for EPA refrigerant regulation, other manufacturers suggested that aligning EPA and DOE compliance dates would avoid successive redesigns and reduce cumulative regulatory burden.

b. Scope Expansion

In interviews, some manufacturers were opposed to expanding the scope of coverage to include low-capacity ice makers. These manufacturers noted that many low-capacity ice makers are intended for residential use and have different utilization patterns, operating conditions, warranties, and durability requirements compared to covered automatic commercial ice makers. Manufacturers questioned the benefit of including low-capacity ice makers and covered automatic commercial ice makers under the same standards rulemaking given these differences. They asserted that including both low-capacity ice makers and covered automatic commercial ice makers in the NOPR analysis would make it challenging to interpret the results of the analysis and understand the implications for the residential and commercial market segments.

c. Supply Chain Concerns

Multiple manufacturers expressed concerns about the ongoing supply chain constraints related to sourcing a range of components, such as ECMs, compressors, and control boards and electronics. Manufacturers noted that limited component availability, increases in raw material prices, and escalating shipping and transportation costs all affect manufacturer production costs. In addition to higher production costs, these manufacturers stated that the evolving nature of these component shortages requires significant personnel resources to identify and qualify new suppliers, build prototypes, conduct testing, and update product literature. For many manufacturers these shortages have meant shifting resources away from typical product development. If these supply constraints continue through the end of the conversion period, industry could face capacity constraints.

4. Discussion of MIA Comments

In response to the March 2022 Preliminary Analysis, AHRI and Hoshizaki encouraged DOE to consider the various restrictions being placed on HFC refrigeration and the overall impact on automatic commercial ice makers to ensure that sufficient time is given for the industry to find solutions to the GWP and HFC restrictions. (AHRI, No. 21 at p. 5; Hoshizaki, No. 20 at p. 4) Specifically, AHRI and Hoshizaki discussed the EPA restrictions on the sale and production of HFC refrigerants and the potential for State regulations (*e.g.*, California Air Resources Board) limiting the use of high-GWP refrigerants in automatic commercial ice makers. (*Id.*) In addition, AHRI detailed international regulations, such as refrigerant restrictions in Europe and Canada, prohibiting the use of high-GWP refrigerants. (AHRI, No. 21 at p. 5) Hoshizaki noted that significant research, testing, and design time is being allocated to meet the refrigerant regulations, which places a large burden on ACIM manufacturers. (Hoshizaki, No. 20 at p. 4) AHRI suggested that DOE consider the costs required to retrofit manufacturing facilities to enable the use of flammable refrigerants, noting that the Montreal Protocol estimated costs of $250K to $500K to retrofit manufacturing facilities with explosion-proof equipment in 2014. (AHRI, No. 21 at p. 3) AHRI also commented that meeting the EPA's GWP requirements itself has a significant resource and cost impact to all ACIM companies. (*Id.* at p. 5) During the May 5, 2022, public meeting, Welbilt stated that using a flammable refrigerant requires changes to the construction of the equipment to meet agency approval as well as changes to the manufacturing facility to deal with flammable refrigerants. (Public Meeting Transcript, No. 25 at p. 34).

DOE understands that adapting product lines to meet the current and upcoming refrigerant regulations requires significant development and testing time. In particular, DOE understands that switching from non-flammable to flammable refrigerants (*e.g.*, R-290) requires time and investment to redesign ACIM models and upgrade production facilities to accommodate the additional structural and safety precautions required. As discussed in section IV.C.1 of this document, DOE expects ACIM manufacturers will transition most models to R-290 or R-600a to comply with anticipated refrigeration regulations, such as December 2022 EPA NOPR,[56] prior to the expected 2027 compliance date of potential energy conservation standards. Therefore, the engineering analysis assumes the use of R-290 or R-600a compressors as a baseline design option for most equipment classes. See section IV.C.1 of this document for additional information on refrigerant assumptions in the engineering analysis. DOE accounted for the costs

[56] The proposed rule was published on December 15, 2022. 87 FR 76738.

associated with redesigning automatic commercial ice makers to make use of flammable refrigerants and upgrading production facilities to accommodate flammable refrigerants in the GRIM. DOE relied on manufacturer feedback in confidential interviews and a report prepared for EPA[57] to estimate the industry refrigerant transition costs. See section V.B.2.e of this document and chapter 12 of the NOPR TSD for additional discussion on cumulative regulatory burden.

In response to the March 2022 Preliminary Analysis, NAFEM and Hoshizaki commented that DOE should not consider amending energy consumption requirements of automatic commercial ice makers until there is clarity on the impact of EPA's regulations on the industry's existing automatic commercial ice makers. (NAFEM, No. 19 at p. 4; Hoshizaki, No. 20 at p. 5) NAFEM and Hoshizaki also commented that the phasedown of the production of HFC affects many parts of DOE's analysis, including efficiency, availability, and cost changes, especially into forecasting through 2024 and 2036. (*Id.*) NAFEM noted that the AIM Act is imposing restrictions on production of HFC in 2022 (and 2024), which is causing the costs of HFC to increase, and that it does not appear that DOE accounted for these cost increases in its analysis. (NAFEM, No. 19 at p. 4)

DOE notes that there are statutory requirements under EPCA to review standards for automatic commercial ice makers at least every 5 years after the effective date of any amended standards. (42 U.S.C. 6313(d)(3)(B)) DOE understands that regulatory and technical uncertainty surrounding alternative refrigerants adds complexity to analyzing the potential impact of new or amended energy conservation standards. For this NOPR, DOE assumed EPA's proposed rule restricting the use of certain HFCs in automatic

[57] *See* pp. 5–113 of the "Global Non-CO2 Greenhouse Gas Emission Projections & Marginal Abatement Cost Analysis: Methodology Documentation" (2019). *www.epa.gov/sites/default/files/2019-09/documents/nonco2_methodology_report.pdf*

commercial ice makers would be adopted as proposed, with compliance required by January 1, 2025. *See* 87 FR 76738, 76773–76774. Based on manufacturer feedback in confidential interviews, DOE assumed self-contained classes and ice-making head classes with a harvest rate of up to 1,500 lb/day will make use of R-290 or R-600a. As discussed in section IV.C.1.a of this document, DOE proposes to use baseline efficiency levels for automatic commercial ice makers with harvest rates of up to 1,500 lb ice/24 h with non-remote condensers, which reflect the design changes made by manufacturers in response to the December 2022 EPA NOPR that incorporate refrigerant conversion to R-290 or R-600a to a design at the current baseline level using current refrigerants in this NOPR. For non-remote condensing automatic commercial ice makers with harvest rates above 1,500 lb ice/24 h and all remote condensing automatic commercial ice makers, DOE expects that the baseline level for the NOPR analysis is equal to the current DOE ACIM energy conservation standard level. In this NOPR, DOE did not consider additional compressor efficiency improvements beyond the baseline because DOE expects that the compressors currently available on the market for refrigerants used to comply with the December 2022 EPA NOPR represent the maximum compressor efficiency achievable for each respective equipment class. DOE only considered refrigerant costs for refrigerants not prohibited by the December 2022 EPA NOPR for automatic commercial ice makers.

In response to the March 2022 Preliminary Analysis, AHRI requested that DOE analyze the effects of separate efficiency requirements on batch and continuous ACIM manufacturers. (AHRI, No. 21 at p. 9)

DOE presents separate industry cash flow analysis results for analyzed batch and continuous equipment classes in chapter 12 of the NOPR TSD.

Whirlpool commented that energy conservation standards for low-capacity automatic commercial ice makers could force manufacturers to re-evaluate their manufacturing and product development decisions. (Whirlpool, No. 26 at p. 4) Whirlpool stated that it may not be cost-effective to make significant capital and product investments to redesign these products to meet energy conservation standards designed for commercial products. (*Id.*) Whirlpool noted that if energy conservation standards threaten their ability to make "clear ice," then there may be little benefit for households to purchase a separate undercounter ice maker, as the quality and type of the ice is a purchase factor for the consumers of these products, and absent those differentiating factors, consumers may choose to forgo this discretionary purchase. (*Id.*)

DOE used the GRIM, as described in section IV.J.2 of this document, to determine the quantitative impacts on the ACIM equipment industry as a whole. Additionally, DOE presented separate industry cash flow analysis results for the proposed low-capacity equipment classes in chapter 12 of the NOPR TSD. DOE acknowledges that impacts on individual manufacturers may vary from industry averages due to a wide range of company-specific factors including, but not limited to, differences in efficiency of current product offerings, production volumes, and legacy investments in manufacturing plants. DOE also acknowledges that standards necessitating significant investment relative to a company's ACIM equipment market share could force manufacturers to re-evaluate their manufacturing and development decisions. Regarding the reference to the energy conservation standards being designed for commercial products, DOE conducted product teardowns of representative units and analyzed the likely design paths to improve efficiency for fifteen directly analyzed equipment classes, including three proposed low-capacity equipment classes. Thus, the analysis of the proposed low-capacity equipment classes reflects representative units available on the market. See section IV.C of this document for additional details on the engineering analysis.

Regarding Whirlpool's concern about energy conservation standards potentially hindering their ability to make "clear ice," as discussed in section IV.B of this document and chapter 4 of the NOPR TSD, DOE considers the impacts on product utility as part of the screening analysis. If a technology is determined to have a significant adverse impact on the utility of the product to subgroups of consumers, or results in the unavailability of any covered product type with performance characteristics (including reliability), features, sizes, capacities, and volumes that are substantially the same as products generally available in the United States at the time, it will not be considered further. DOE did not receive any comments in response to the March 2022 Preliminary Analysis specific to the screening analysis. When developing the baseline energy use discussed in section IV.C.1.a of this document, DOE analyzed clear, standard-sized cube style batch automatic commercial ice makers and nugget style continuous automatic commercial ice makers. Therefore, the efficiency levels presented in this NOPR are based on these ice characteristics.

K. Emissions Analysis

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

The analysis of electric power sector emissions of CO_2, NO_X, SO_2, and Hg uses emissions factors intended to represent the marginal impacts of the change in electricity consumption associated with amended or new standards. The methodology is based on results published for the *AEO*, including a set of side cases that implement a variety of efficiency-related policies. The methodology is described in appendix 13A of the NOPR TSD. The analysis presented in this document uses projections from *AEO2022*. Power sector emissions of CH_4 and N_2O from fuel combustion are estimated using Emission Factors for Greenhouse Gas Inventories published by the EPA.[58]

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

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

In response to the emissions impact analysis in the March 2022 Preliminary Analysis, AHRI commented that any analysis of emissions should be done in collaboration with refrigerant changes. (AHRI, No. 21 at p. 10)

DOE incorporated refrigerant changes into the engineering analysis. The emissions analysis in this NOPR accounts for baseline ACIM equipment and changes in

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

efficiency levels analyzed in the engineering analysis, which includes changes related to refrigerant technology.

1. Air Quality Regulations Incorporated in DOE's Analysis

DOE's no-new-standards case for the electric power sector reflects the *AEO*, which incorporates the projected impacts of existing air quality regulations on emissions. *AEO2022* generally represents current legislation and environmental regulations, including recent government actions, that were in place at the time of preparation of *AEO2022*, including the emissions control programs discussed in the following paragraphs.[59]

SO_2 emissions from affected electric generating units (EGUs) are subject to nationwide and regional emissions cap-and-trade programs. Title IV of the Clean Air Act sets an annual emissions cap on SO_2 for affected EGUs in the 48 contiguous states and the District of Columbia (D.C.). (42 U.S.C. 7651 *et seq.*) SO_2 emissions from numerous states in the eastern half of the United States are also limited under the Cross-State Air Pollution Rule (CSAPR). 76 FR 48208 (Aug. 8, 2011). CSAPR requires these states to reduce certain emissions, including annual SO_2 emissions, and went into effect as of January 1, 2015.[60] *AEO2022* incorporates implementation of CSAPR, including the update to the CSAPR ozone season program emission budgets and target dates issued in 2016. 81 FR 74504 (Oct. 26, 2016). Compliance with CSAPR is flexible among EGUs

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[59] For further information, *see* the Assumptions to *AEO2022* report that sets forth the major assumptions used to generate the projections in the Annual Energy Outlook. Available at *www.eia.gov/outlooks/aeo/assumptions/* (last accessed December 1, 2022).

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

and is enforced through the use of tradable emissions allowances. Under existing EPA regulations, any excess SO_2 emissions allowances resulting from the lower electricity demand caused by the adoption of an efficiency standard could be used to permit offsetting increases in SO_2 emissions by another regulated EGU.

However, beginning in 2016, SO_2 emissions began to fall as a result of the Mercury and Air Toxics Standards (MATS) for power plants. 77 FR 9304 (Feb. 16, 2012). In the MATS final rule, EPA established a standard for hydrogen chloride as a surrogate for acid gas hazardous air pollutants (HAP), and also established a standard for SO_2 (a non-HAP acid gas) as an alternative equivalent surrogate standard for acid gas HAP. The same controls are used to reduce HAP and non-HAP acid gas; thus, SO_2 emissions are being reduced as a result of the control technologies installed on coal-fired power plants to comply with the MATS requirements for acid gas. In order to continue operating, coal power plants must have either flue gas desulfurization or dry sorbent injection systems installed. Both technologies, which are used to reduce acid gas emissions, also reduce SO_2 emissions. Because of the emissions reductions under the MATS, it is unlikely that excess SO_2 emissions allowances resulting from the lower electricity demand would be needed or used to permit offsetting increases in SO_2 emissions by another regulated EGU. Therefore, energy conservation standards that decrease electricity generation would generally reduce SO_2 emissions. DOE estimated SO_2 emissions reduction using emissions factors based on *AEO2022*.

CSAPR also established limits on NO_X emissions for numerous states in the eastern half of the United States. Energy conservation standards would have little effect on NO_X emissions in those states covered by CSAPR emissions limits if excess NO_X emissions allowances resulting from the lower electricity demand could be used to permit offsetting increases in NO_X emissions from other EGUs. In such case, NO_X emissions would remain near the limit even if electricity generation goes down. A different case could possibly result, depending on the configuration of the power sector in the different regions and the need for allowances, such that NO_X emissions might not remain at the limit in the case of lower electricity demand. In this case, energy conservation standards might reduce NO_X emissions in covered states. Despite this possibility, DOE has chosen to be conservative in its analysis and has maintained the assumption that standards will not reduce NO_X emissions in states covered by CSAPR. Energy conservation standards would be expected to reduce NO_X emissions in the states not covered by CSAPR. DOE used *AEO2022* data to derive NO_X emissions factors for the group of states not covered by CSAPR.

The MATS limit mercury emissions from power plants, but they do not include emissions caps and, as such, DOE's energy conservation standards would be expected to slightly reduce Hg emissions. DOE estimated mercury emissions reduction using emissions factors based on *AEO2022*, which incorporates the MATS.

L. Monetizing Emissions Impacts

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

To monetize the benefits of reducing GHG emissions, this analysis uses the interim estimates presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990* published in February 2021 by the IWG.

DOE requests comments on how to address the climate benefits and other non-monetized effects of the proposal.

1. Monetization of Greenhouse Gas Emissions

DOE estimates the monetized benefits of the reductions in emissions of CO_2, CH_4, and N_2O by using a measure of the SC of each pollutant (*e.g.*, SC-CO_2). These estimates represent the monetary value of the net harm to society associated with a marginal increase in emissions of these pollutants in a given year, or the benefit of avoiding that increase. These estimates are intended to include (but are not limited to) climate-change-related changes in net agricultural productivity, human health, property damages from increased flood risk, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services.

DOE exercises its own judgment in presenting monetized climate benefits as recommended by applicable Executive Orders, and DOE would reach the same conclusion presented in this proposed rulemaking in the absence of the social cost of greenhouse gases. That is, the social costs of greenhouse gases, whether measured using the February 2021 interim estimates presented by the IWG or by another means, did not affect the rule ultimately proposed by DOE.

DOE estimated the global social benefits of CO_2, CH_4, and N_2O reductions using SC-GHG values that were based on the interim values presented in the *Technical Support*

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

The SC-GHGs estimates presented here were developed over many years, using a transparent process, peer-reviewed methodologies, the best science available at the time of that process, and with input from the public. Specifically, in 2009, the IWG, which included the DOE and other executive branch agencies and offices, was established to ensure that agencies were using the best available science and to promote consistency in the social cost of carbon ($SC\text{-}CO_2$) values used across agencies. The IWG published $SC\text{-}CO_2$ estimates in 2010 that were developed from an ensemble of three widely cited integrated assessment models (IAMs) that estimate global climate damages using highly aggregated representations of climate processes and the global economy combined into a single modeling framework. The three IAMs were run using a common set of input assumptions in each model for future population, economic, and CO_2 emissions growth, as well as equilibrium climate sensitivity—a measure of the globally averaged temperature response to increased atmospheric CO_2 concentrations. These estimates were updated in 2013 based on new versions of each IAM. In August 2016, the IWG published estimates of SC-CH_4 and SC-N_2O using methodologies that are consistent with the methodology underlying the SC-CO_2 estimates. The modeling approach that extends the IWG SC-CO_2 methodology to non-CO_2 GHGs has undergone multiple stages of peer review. The SC-CH_4 and SC-N_2O estimates were developed by Marten *et al*.[61] and underwent a standard double-blind peer review process prior to journal publication. In 2015, as part of the response to public comments received following a 2013 solicitation for comments on the SC-CO_2 estimates, the IWG announced a National Academies of Sciences, Engineering, and Medicine review of the SC-CO_2 estimates to offer advice on how to approach future updates to ensure that the estimates continue to reflect the best available science and methodologies. In January 2017, the National Academies released their final report, Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide, and recommended specific criteria for future updates to the SC-CO_2 estimates, a modeling framework to satisfy the specified criteria, and both near-term updates and longer-term research needs pertaining to various components of the estimation process (National Academies, 2017).[62] Shortly thereafter, in March 2017, President Trump issued Executive Order 13783, which disbanded the IWG, withdrew the previous TSDs, and directed agencies to ensure SC-CO_2 estimates used in regulatory analyses are consistent with the guidance contained in OMB's Circular A-4, "including with respect to the consideration of domestic versus international impacts and the consideration of appropriate discount rates" (EO 13783, Section 5(c)) Benefit-cost

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[61] Marten, A. L., E. A. Kopits, C. W. Griffiths, S. C. Newbold, and A. Wolverton. Incremental CH_4 and N_2O mitigation benefits consistent with the US Government's SC-CO2 estimates. *Climate Policy*. 2015. 15(2): pp. 272–298.

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

analyses following E.O. 13783 used SC-GHG estimates that attempted to focus on the U.S.-specific share of climate change damages as estimated by the models and were calculated using two discount rates recommended by Circular A-4, 3 percent and 7 percent. All other methodological decisions and model versions used in SC-GHG calculations remained the same as those used by the IWG in 2010 and 2013, respectively.

On January 20, 2021, President Biden issued Executive Order 13990, which re-established the IWG and directed it to ensure that the U.S. government's estimates of the social cost of carbon and other greenhouse gases reflect the best available science and the recommendations of the National Academies (2017). The IWG was tasked with first reviewing the SC-GHG estimates currently used in Federal analyses and publishing interim estimates within 30 days of the Executive Order that reflect the full impact of GHG emissions, including by taking global damages into account. The interim SC-GHG estimates published in February 2021 are used here to estimate the climate benefits for this proposed rulemaking. The Executive Order instructs the IWG to undertake a fuller update of the SC-GHG estimates by January 2022 that takes into consideration the advice of the National Academies (2017) and other recent scientific literature. The February 2021 SC-GHG TSD provides a complete discussion of the IWG's initial review conducted under E.O. 13990. In particular, the IWG found that the SC-GHG estimates used under E.O. 13783 fail to reflect the full impact of GHG emissions in multiple ways.

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

Second, the IWG found that the use of the social rate of return on capital (7 percent under current OMB Circular A-4 guidance) to discount the future benefits of reducing GHG emissions inappropriately underestimates the impacts of climate change for the purposes of estimating the SC-GHG. Consistent with the findings of the National Academies (2017) and the economic literature, the IWG continued to conclude that the consumption rate of interest is the theoretically appropriate discount rate in an intergenerational context,[63] and recommended that discount rate uncertainty and relevant aspects of intergenerational ethical considerations be accounted for in selecting future discount rates.

Furthermore, the damage estimates developed for use in the SC-GHG are estimated in consumption-equivalent terms, and so an application of OMB Circular A-4's guidance for regulatory analysis would then use the consumption discount rate to calculate the SC-GHG. DOE agrees with this assessment and will continue to follow developments in the literature pertaining to this issue. DOE also notes that while OMB Circular A-4, as published in 2003, recommends using 3-percent and 7-percent discount

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

rates as "default" values, Circular A-4 also reminds agencies that "different regulations may call for different emphases in the analysis, depending on the nature and complexity of the regulatory issues and the sensitivity of the benefit and cost estimates to the key assumptions." On discounting, Circular A-4 recognizes that "special ethical considerations arise when comparing benefits and costs across generations," and Circular A-4 acknowledges that analyses may appropriately "discount future costs and consumption benefits…at a lower rate than for intragenerational analysis." In the 2015 Response to Comments on the Social Cost of Carbon for Regulatory Impact Analysis, OMB, DOE, and the other IWG members recognized that "Circular A-4 is a living document" and "the use of 7 percent is not considered appropriate for intergenerational discounting. There is wide support for this view in the academic literature, and it is recognized in Circular A-4 itself." Thus, DOE concludes that a 7-percent discount rate is not appropriate to apply to value the social cost of greenhouse gases in the analysis presented in this analysis.

To calculate the present and annualized values of climate benefits, DOE uses the same discount rate as the rate used to discount the value of damages from future GHG emissions, for internal consistency. That approach to discounting follows the same approach that the February 2021 SC-GHG TSD recommends "to ensure internal consistency—*i.e.*, future damages from climate change using the SC-GHG at 2.5 percent should be discounted to the base year of the analysis using the same 2.5 percent rate." DOE has also consulted the National Academies' 2017 recommendations on how SC-GHG estimates can "be combined in RIAs with other cost and benefits estimates that may use different discount rates." The National Academies reviewed several options, including "presenting all discount rate combinations of other costs and benefits with [SC-GHG] estimates."

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

There are a number of limitations and uncertainties associated with the SC-GHG estimates. First, the current scientific and economic understanding of discounting approaches suggests discount rates appropriate for intergenerational analysis in the context of climate change are likely to be less than 3 percent, and near 2 percent or lower.[64] Second, the IAMs used to produce these interim estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature, and the science underlying their "damage functions" (*i.e.*, the core parts of the IAMs that map global mean temperature changes and other physical impacts of climate change into economic (both market and nonmarket) damages) lags behind the most recent research. For example, limitations include the incomplete treatment of catastrophic and non-catastrophic impacts in the integrated assessment models, their incomplete treatment of adaptation and technological change, the incomplete way in which inter-regional and intersectoral linkages are modeled, uncertainty in the extrapolation of damages to high temperatures, and inadequate representation of the relationship between the discount rate and uncertainty in economic growth over long time horizons. Likewise, the socioeconomic and emissions scenarios used as inputs to the models do not reflect new information from the last decade of scenario generation or the full range of projections. The modeling limitations do not all work in the same direction in terms of their influence on the SC-CO_2 estimates. However, as discussed in the February 2021 SC-GHG TSD, the IWG has recommended that, taken together, the limitations suggest the interim SC-GHG estimates used in this proposed rule likely underestimate the damages from GHG emissions. DOE concurs with this assessment.

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

DOE's derivations of the $SC-CO_2$, $SC-N_2O$, and $SC-CH_4$ values used for this NOPR are discussed in the following sections, and the results of DOE's analyses estimating the benefits of the reductions in emissions of these GHGs are presented in section V.B.3.c of this document.

a. Social Cost of Carbon

The $SC-CO_2$ values used for this NOPR were based on the values presented for the IWG's February 2021 SC-GHG TSD. Table IV.12 shows the updated sets of $SC-CO_2$ estimates from the IWG's TSD in 5-year increments from 2020 to 2050. The full set of annual values that DOE used is presented in appendix 14A of the NOPR TSD. For purposes of capturing the uncertainties involved in the regulatory impact analysis, DOE has determined it is appropriate to include all four sets of $SC-CO_2$ values, as recommended by the IWG.[65]

Table IV.12 Annual $SC-CO_2$ Values from 2021 Interagency Update, 2020–2050 (2020$ per Metric Ton CO_2)

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

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

For 2051 to 2070, DOE used SC-CO_2 estimates published by EPA, adjusted to 2020$.[66] These estimates are based on methods, assumptions, and parameters identical to the 2020–2050 estimates published by the IWG. (which were based on EPA modeling).

DOE multiplied the CO_2 emissions reduction estimated for each year by the SC-CO_2 value for that year in each of the four cases. DOE adjusted the values to 2022$ using the implicit price deflator for GDP from the Bureau of Economic Analysis. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the four cases using the specific discount rate that had been used to obtain the SC-CO_2 values in each case.

b. Social Cost of Methane and Nitrous Oxide

The SC-CH_4 and SC-N_2O values used for this NOPR were based on the values developed for the February 2021 SC-GHG TSD. Table IV.13 shows the updated sets of SC-CH_4 and SC-N_2O estimates from the latest interagency update in 5-year increments from 2020 to 2050. The full set of annual values used is presented in appendix 14A of the NOPR TSD. To capture the uncertainties involved in the regulatory impact analysis, DOE has determined it is appropriate to include all four sets of SC-CH_4 and SC-N_2O values, as recommended by the IWG. DOE derived values after 2050 using the approach described previously for the SC-CO_2.

Table IV.13 Annual SC-CH_4 and SC-N_2O Values from 2021 Interagency Update, 2020–2050 (2020$ per Metric Ton)

Year	SC-CH_4				SC-N_2O			
	Discount Rate and Statistic				Discount Rate and Statistic			
	5%	3%	2.5%	3%	5%	3%	2.5 %	3%
	Average	Average	Average	95th percentile	Average	Average	Average	95th percentile
2020	670	1,500	2,000	3,900	5,800	18,000	27,000	48,000

[66] See EPA, *Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards: Regulatory Impact Analysis*, Washington, D.C., December 2021. Available at: *nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1013ORN.pdf* (last accessed January 13, 2023).

2025	800	1,700	2,200	4,500	6,800	21,000	30,000	54,000
2030	940	2,000	2,500	5,200	7,800	23,000	33,000	60,000
2035	1,100	2,200	2,800	6,000	9,000	25,000	36,000	67,000
2040	1,300	2,500	3,100	6,700	10,000	28,000	39,000	74,000
2045	1,500	2,800	3,500	7,500	12,000	30,000	42,000	81,000
2050	1,700	3,100	3,800	8,200	13,000	33,000	45,000	88,000

DOE multiplied the CH_4 and N_2O emissions reduction estimated for each year by the SC-CH_4 and SC-N_2O estimates for that year in each of the cases. DOE adjusted the values to 2022$ using the implicit price deflator for GDP from the Bureau of Economic Analysis. To calculate a present value of the stream of monetary values, DOE discounted the values in each of the cases using the specific discount rate that had been used to obtain the SC-CH_4 and SC-N_2O estimates in each case.

2. Monetization of Other Emissions Impacts

For this NOPR, DOE estimated the monetized value of NO_X and SO_2 emissions reductions from electricity generation using the latest benefit per ton estimates for that sector from the EPA's Benefits Mapping and Analysis Program.[67] DOE used EPA's values for $PM_{2.5}$-related benefits associated with NO_X and SO_2 and for ozone-related benefits associated with NO_X for 2025, 2030, and 2040, calculated with discount rates of 3 percent and 7 percent. DOE used linear interpolation to define values for the years not given in the 2025 to 2040 period; for years beyond 2040, the values are held constant. DOE combined the EPA benefit per ton estimates with regional information on electricity consumption and emissions to define weighted-average national values for NO_X and SO_2 as a function of sector (see appendix 14B of the NOPR TSD).

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

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

M. Utility Impact Analysis

The utility impact analysis estimates the changes in installed electrical capacity and generation projected to result for each considered TSL. The analysis is based on published output from the NEMS associated with *AEO2022*. NEMS produces the *AEO* Reference case, as well as a number of side cases that estimate the economy-wide impacts of changes to energy supply and demand. For the current analysis, impacts are quantified by comparing the levels of electricity sector generation, installed capacity, fuel consumption and emissions in the *AEO2022* Reference case and various side cases. Details of the methodology are provided in the appendices to chapters 13 and 15 of the NOPR TSD.

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

N. Employment Impact Analysis

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

One method for assessing the possible effects on the demand for labor of such shifts in economic activity is to compare sector employment statistics developed by the Labor Department's Bureau of Labor Statistics (BLS). BLS regularly publishes its estimates of the number of jobs per million dollars of economic activity in different sectors of the economy, as well as the jobs created elsewhere in the economy by this same economic activity. Data from BLS indicate that expenditures in the utility sector generally create fewer jobs (both directly and indirectly) than expenditures in other sectors of the economy.[68] 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

[68] *See* U.S. Department of Commerce–Bureau of Economic Analysis. *Regional Multipliers: Regional Input-Output Modeling System (RIMS II) User's Guide*. U.S. Government Printing Office: Washington, DC. Available at *www.bea.gov/sites/default/files/methodologies/RIMSII_User_Guide.pdf* (last accessed January 17, 2023).

sector) to more labor-intensive sectors (*e.g.*, the retail and service sectors). Thus, the BLS data suggest that net national employment may increase due to shifts in economic activity resulting from energy conservation standards.

DOE estimated indirect national employment impacts for the standard levels considered in this NOPR using an input/output model of the U.S. economy called Impact of Sector Energy Technologies version 4 (ImSET).[69] ImSET is a special-purpose version of the "U.S. Benchmark National Input-Output" (I-O) model, which was designed to estimate the national employment and income effects of energy-saving technologies. The ImSET software includes a computer-based I-O model having structural coefficients that characterize economic flows among 187 sectors most relevant to industrial, commercial, and residential building energy use.

DOE notes that ImSET is not a general equilibrium forecasting model and acknowledges 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 overestimate actual job impacts over the long run for this proposed rule. Therefore, DOE used ImSET only to generate results for near-term timeframes (2027–2031), where these uncertainties are reduced. For more details on the employment impact analysis, see chapter 16 of the NOPR TSD.

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

V. Analytical Results and Conclusions

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

A. Trial Standard Levels

In general, DOE typically evaluates potential amended standards for products and equipment by grouping individual efficiency levels for each class into TSLs. Use of TSLs allows DOE to identify and consider manufacturer cost interactions between the equipment classes, to the extent that there are such interactions, and market cross elasticity from consumer purchasing decisions that may change when different standard levels are set.

In the analysis conducted for this NOPR, DOE analyzed the benefits and burdens of four TSLs for ACIM equipment. DOE developed TSLs that combine efficiency levels for each analyzed equipment class/category. Table V.1 presents the TSLs and the corresponding efficiency levels that DOE has identified for potential amended energy conservation standards for automatic commercial ice makers. TSL 4 represents the max-tech energy efficiency for all equipment classes. TSL 3 is comprised of the maximum efficiency level with a positive LCC savings. TSL 2 represents efficiency levels with maximum LCC savings. TSL 1 represents EL 1 for all equipment classes that have positive LCC savings. DOE presents the results for the TSLs in this document, while the results for all efficiency levels that DOE analyzed are in the NOPR TSD.

Table V.1 Trial Standard Levels for Automatic Commercial Ice Makers

Equipment Class	TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	EL 0	EL 0	EL 0	EL 3
B-IMH-W (≥785 and <1,500)	EL 0	EL 0	EL 0	EL 3
B-IMH-A (≥300 and <727)	EL 1	EL 2	EL 3	EL 6
B-IMH-A (≥727 and <1,500)	EL 1	EL 2	EL 4	EL 6
B-RC(NRC)-A (≥988 and <4,000)	EL 1	EL 1	EL 2	EL 6
B-SC-A (Portable ACIM) (≤38)	EL 1	EL 2	EL 2	EL 3
B-SC-A (Refrigerated Storage ACIM)	EL 1	EL 2	EL 2	EL 3
B-SC-A (<=50)	EL 1	EL 1	EL 1	EL 7
B-SC-A (>50 and <134)	EL 0	EL 0	EL 0	EL 6
B-SC-A (≥200 and <4,000)	EL 1	EL 2	EL 4	EL 6
C-IMH-W (>50 and <801)	EL 0	EL 0	EL 0	EL 2
C-IMH-A (≥310 and <820)	EL 1	EL 2	EL 3	EL 5
C-RC&RC-A (≥800 and <4,000)	EL 1	EL 2	EL 4	EL 5
C-SC-A (>50 and <149)	EL 1	EL 1	EL 1	EL 5
C-SC-A (≥149 and <700)	EL 1	EL 1	EL 2	EL 5

B = batch; C = continuous.
IMH = ice making head; SC = self-contained; RC = remote condensing.
W = water type of cooling; A = air type of cooling.
Number in parentheses indicates harvest rate.

Table V.2 presents the TSLs and the corresponding percent reduction below baseline per equipment class. The baseline values are presented in Table IV.8 and discussed in section IV.C.1.a of this document. TSL 4 represents the max-tech energy efficiency for all equipment classes. TSL 3 is comprised of the maximum efficiency level with a positive LCC savings. TSL 2 represents efficiency levels with maximum LCC savings. TSL 1 represents EL 1 for all equipment classes that have positive LCC savings. DOE presents the results for the TSLs in this document, while the results for all efficiency levels that DOE analyzed are in the NOPR TSD.

Table V.2 Trial Standard Levels for Automatic Commercial Ice Makers

Equipment Class	TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	0.0%	0.0%	0.0%	4.7%
B-IMH-W (≥785 and <1,500)	0.0%	0.0%	0.0%	4.2%
B-IMH-A (≥300 and <727)	2.8%	3.8%	6.1%	10.3%
B-IMH-A (≥727 and <1,500)	3.4%	7.1%	8.2%	11.6%
B-RC(NRC)-A (≥ 988 and <4,000)	2.7%	2.7%	3.1%	7.0%
B-SC-A (Portable ACIM) (≤38)	2.0%	3.6%	3.6%	4.7%
B-SC-A (Refrigerated Storage ACIM)	4.0%	8.5%	8.5%	9.6%
B-SC-A (<=50)	12.3%	12.3%	12.3%	26.9%
B-SC-A (>50 and <134)	0.0%	0.0%	0.0%	11.3%
B-SC-A (≥ 200 and <4,000)	4.8%	10.1%	11.8%	15.6%
C-IMH-W (>50 and <801)	0.0%	0.0%	0.0%	9.6%
C-IMH-A (≥310 and <820)	7.0%	8.1%	16.7%	19.9%
C-RC&RC-A (≥800 and <4,000)	3.5%	7.5%	9.1%	11.0%
C-SC-A (>50 and <149)	1.7%	1.7%	1.7%	8.2%
C-SC-A (≥149 and <700)	1.5%	1.5%	2.5%	12.1%

DOE constructed the TSLs for this NOPR to include efficiency levels representative of efficiency levels with similar characteristics (*i.e.*, using similar technologies and/or efficiencies, and having roughly comparable equipment availability). The use of representative efficiency levels provided for greater distinction between the TSLs. While representative efficiency levels were included in the TSLs, DOE considered all efficiency levels as part of its analysis.[70]

B. Economic Justification and Energy Savings

1. Economic Impacts on Individual Consumers

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

[70] Efficiency levels that were analyzed for this NOPR are discussed in section IV.C.4 of this document. Results by efficiency level are presented in chapters 8 and 10 of the NOPR TSD.

a. Life-Cycle Cost and Payback Period

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

Table V.3 through Table V.32 show the LCC and PBP results for the TSLs considered for each equipment class. In the first of each pair of tables, the simple payback is measured relative to the baseline equipment. In the second table, impacts are measured relative to the efficiency distribution in the no-new-standards case in the compliance year (2027). Because some consumers purchase equipment with higher efficiency in the no-new-standards case, the average savings are less than the difference between the average LCC of the baseline equipment and the average LCC at each TSL. The savings refer only to consumers who are affected by a standard at a given TSL. Those who already purchase equipment with efficiency at or above a given TSL are not affected. Consumers for whom the LCC increases at a given TSL experience a net cost.

All equipment classes have negative LCC savings values at TSL 4. Negative average LCC savings imply that, on average, consumers experience an increase in LCC of the equipment as a consequence of buying equipment associated with that particular TSL. These results indicate the cost increments associated with the max-tech design option are high, and the increase in LCC (and corresponding decrease in LCC savings) indicates that this design option may result in negative consumer impacts. TSL 4 is associated with the max-tech level for all the equipment classes. For large-capacity batch ACIM equipment, ECM pump motors are the design option associated with max-tech efficiency levels. For low-capacity batch ACIM equipment, tube and fin microchannel condensers were typically the design option associated with the max-tech efficiency levels. For the large-capacity continuous ACIM equipment, ECM auger motors and drain water heat exchangers were the design options associated with max-tech efficiency levels.

The mean LCC savings associated with TSL 3 are all positive values for all equipment classes. The mean LCC savings at all lower TSL levels are also positive. The trend is generally an increase in LCC savings for TSL 1 and TSL 2, with LCC savings declining or remaining flat at TSL 3 and TSL 4. In seven cases, the highest LCC savings are at TSL 2: B-IMH-A (≥300 and <727), B-IMH-A (≥ 727 and <1,500), B-SC-A (Refrigerated Storage ACIM), B-SC-A (≥200 and <4,000), C-IMH-A (≥310 and <820), C-RC&RC-A (≥800 and <4,000), and C-SC-A (≥149 and <700). The drop-off in LCC savings at TSL 4 is generally associated with the relatively large cost for the max-tech design options, the savings for which frequently span the last two efficiency levels.

As described in section IV.H.2 of this document, DOE used a "roll-up" scenario in this rulemaking. Under the roll-up scenario, DOE assumes that the market shares of the efficiency levels (in the no-new-standards case) that do not meet the standard level under consideration would be "rolled up" into (meaning "added to") the market share of the efficiency level at the standard level under consideration, and the market shares of efficiency levels that are above the standard level under consideration would remain unaffected.

In the no-new-standards case scenario, consumers who buy the equipment at or above the TSL under consideration would be unaffected if the amended standard were to be set at that TSL. In the no-new-standards scenario, consumers who buy equipment below the TSL under consideration would be affected if the amended standard were to be set at that TSL. Among these affected consumers, some may benefit from a lower LCC of the equipment and some may incur net cost due to a higher LCC, depending on the inputs to the LCC analysis, such as electricity prices, discount rates, installation costs, and markups.

DOE's results indicate that consumers in five equipment classes either benefit or are unaffected by setting standards at TSLs 1, 2, or 3. A large percentage of consumers in batch equipment classes are unaffected by a standard set at TSL 1 given the equivalence to ENERGY STAR and the prevalence of ENERGY STAR-qualifying equipment in those classes. At the other end of the range, in almost all cases, 13 percent of the market would experience net costs at TSL 3. In all fifteen equipment classes modeled, 49 percent or more of consumers would experience a net cost at TSL 4.

The median PBP values for TSLs 1 through 3 are all less than 7 years, ranging from 1.3 to 6 years. PBP values for TSL 4 range from 6.4 years to over 64.7 years. C-SC-A (>50 and <149) exhibits the longest PBP for TSL 4 at 64.7 years.

Table V.3 Average LCC and PBP Results for B-IMH-W (≥300 and <785)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	0	$3,831.82	$2,199.10	$16,162.03	$19,993.84	0.0	0.0
2	0	$3,831.82	$2,199.10	$16,162.03	$19,993.84	0.0	0.0
3	0	$3,831.82	$2,199.10	$16,162.03	$19,993.84	0.0	0.0
4	3	$4,264.38	$2,181.61	$16,040.73	$20,305.10	24.7	8.5

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		

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

Table V.4 Average LCC Savings Relative to the No-New-Standards Case for B-IMH-W (≥300 and <785)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	0	$0.00	0%
2	0	$0.00	0%
3	0	$0.00	0%
4	3	($307.99)	49%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.5 Average LCC and PBP Results for B-IMH-W (≥785 and <1,500)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	0	$5,938.82	$6,613.37	$48,646.27	$54,585.09	0.0	8.5
2	0	$5,938.82	$6,613.37	$48,646.27	$54,585.09	0.0	8.5
3	0	$5,938.82	$6,613.37	$48,646.27	$54,585.09	0.0	8.5
4	3	$6,474.88	$6,572.28	$48,361.24	$54,836.12	13.1	8.5

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

Table V.6 Average LCC Savings Relative to the No-New-Standards Case for B-IMH-W (≥785 and <1,500)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	0	$0.00	0%
2	0	$0.00	0%
3	0	$0.00	0%
4	3	($249.33)	82%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers.

Table V.7 Average LCC and PBP Results for B-IMH-A (≥300 and <727)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$3,453.72	$1,122.43	$8,095.75	$11,549.47	3.4	8.5
2	3	$3,476.08	$1,118.66	$8,069.63	$11,545.71	4.1	8.5
3	3	$3,519.96	$1,110.09	$8,023.06	$11,543.02	4.5	8.5
4	6	$3,968.04	$1,094.33	$7,913.73	$11,881.77	14.3	8.5

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

Table V.8 Average LCC Savings Relative to the No-New-Standards Case for B-IMH-A (≥300 and <727)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** 2022$	Percent of Consumers that Experience Net Cost
1	1	$25.63	4%
2	2	$29.18	6%

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** 2022$	Percent of Consumers that Experience Net Cost
3	3	$21.54	16%
4	6	($315.79)	66%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers.

Table V.9 Average LCC and PBP Results for B-IMH-A (≥727 and <1,500)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$5,792.95	$2,410.05	$17,282.76	$23,075.70	1.3	8.5
2	2	$5,929.70	$2,368.74	$17,036.36	$22,966.06	2.4	8.5
3	4	$6,052.65	$2,356.49	$16,951.35	$23,003.99	3.4	8.5
4	6	$6,568.93	$2,319.00	$16,691.27	$23,260.21	6.4	8.5

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

Table V.10 Average LCC Savings Relative to the No-New-Standards Case for B-IMH-A (≥727 and <1,500)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$194.60	0%
2	2	$300.78	3%
3	4	$232.02	18%
4	6	($30.90)	64%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers.

Table V.11 Average LCC and PBP Results for B-RC(NRC)-A (≥988 and <4,000)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$8,103.70	$2,226.52	$15,820.28	$23,923.97	3.2	8.5
2	1	$8,103.70	$2,226.52	$15,820.28	$23,923.97	3.2	8.5
3	2	$8,199.87	$2,220.77	$15,780.40	$23,980.27	5.3	8.5
4	6	$8,763.43	$2,172.49	$15,445.45	$24,208.87	8.8	8.5

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

Table V.12 Average LCC Savings Relative to the No-New-Standards Case for B-RC(NRC)-A (≥988 and <4,000)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$93.15	3%
2	1	$93.15	3%
3	2	$36.86	10%
4	6	($215.49)	51%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.13 Average LCC and PBP Results for B-SC-A (Portable ACIM) (≤38)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$627.32	$25.15	$335.51	$962.83	3.3	7.5
2	2	$628.81	$24.81	$333.43	$962.25	3.8	7.5
3	2	$628.81	$24.81	$333.43	$962.25	3.8	7.5
4	3	$635.13	$24.60	$332.08	$967.21	9.6	7.5

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

Table V.14 Average LCC Savings Relative to the No-New-Standards Case for B-SC-A (Portable ACIM) (≤38)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$0.81	8%
2	2	$1.29	12%
3	2	$1.29	12%
4	3	($3.83)	84%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.15 Average LCC and PBP Results for B-SC-A (Refrigerated Storage ACIM)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$715.23	$14.29	$265.51	$980.74	2.3	7.5
2	2	$716.20	$13.79	$262.66	$978.86	2.1	7.5

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
3	2	$716.20	$13.79	$262.66	$978.86	2.1	7.5
4	3	$724.11	$13.66	$261.83	$985.94	9.1	7.5

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

Table V.16 Average LCC Savings Relative to the No-New-Standards Case for B-SC-A (Refrigerated Storage ACIM)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$1.46	0%
2	2	$3.25	0%
3	2	$3.25	0%
4	3	($4.04)	86%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.17 Average LCC and PBP Results for B-SC-A (<=50)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$1,778.66	$28.15	$359.35	$2,138.01	5.7	7.5
2	1	$1,778.66	$28.15	$359.35	$2,138.01	5.7	7.5
3	1	$1,778.66	$28.15	$359.35	$2,138.01	5.7	7.5
4	7	$2,303.16	$24.49	$350.67	$2,653.83	43.7	7.5

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

Table V.18 Average LCC Savings Relative to the No-New-Standards Case for B-SC-A (<=50)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$7.98	11%
2	1	$7.98	11%
3	1	$7.98	11%
4	7	($474.08)	90%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.19 Average LCC and PBP Results for B-SC-A (>50 and <134)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	0	$2,782.01	$556.84	$4,060.39	$6,842.40	0.0	8.5
2	0	$2,782.01	$556.84	$4,060.39	$6,842.40	0.0	8.5
3	0	$2,782.01	$556.84	$4,060.39	$6,842.40	0.0	8.5
4	6	$3,360.35	$538.81	$3,955.76	$7,316.11	31.2	8.5

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

Table V.20 Average LCC Savings Relative to the No-New-Standards Case for B-SC-A (>50 and <134)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	0	$0.00	0%
2	0	$0.00	0%
3	0	$0.00	0%
4	6	($470.21)	79%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.21 Average LCC and PBP Results for B-SC-A (≥200 and <4,000)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$3,821.53	$856.72	$6,173.38	$9,994.92	3.5	8.5
2	2	$3,893.30	$842.89	$6,077.43	$9,970.73	4.4	8.5
3	4	$3,963.67	$838.42	$6,052.93	$10,016.60	6.0	8.5
4	6	$4,415.42	$828.46	$6,003.26	$10,418.68	15.7	8.5

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

Table V.22 Average LCC Savings Relative to the No-New-Standards Case for B-SC-A (≥200 and <4,000)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$42.62	5%
2	2	$66.71	15%
3	4	$20.81	46%
4	6	($382.22)	95%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.23 Average LCC and PBP Results for C-IMH-W (>50 and <801)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	0	$5,197.82	$2,990.50	$22,203.66	$27,401.48	0.0	8.5
2	0	$5,197.82	$2,990.50	$22,203.66	$27,401.48	0.0	8.5
3	0	$5,197.82	$2,990.50	$22,203.66	$27,401.48	0.0	8.5
4	2	$6,412.21	$2,935.30	$22,177.17	$28,589.38	22.0	8.5

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

Table V.24 Average LCC Savings Relative to the No-New-Standards Case for C-IMH-W (>50 and <801)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	0	$0.00	0%
2	0	$0.00	0%
3	0	$0.00	0%
4	2	($1,187.75)	91%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.25 Average LCC and PBP Results for C-IMH-A (≥310 and <820)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$4,187.09	$911.97	$6,760.80	$10,947.88	1.4	8.5
2	2	$4,210.42	$907.41	$6,729.18	$10,939.60	1.9	8.5

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
3	3	$4,473.01	$872.86	$6,566.55	$11,039.57	4.8	8.5
4	5	$5,281.18	$859.80	$6,708.18	$11,989.36	14.1	8.5

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

Table V.26 Average LCC Savings Relative to the No-New-Standards Case for C-IMH-A (≥310 and <820)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$144.89	0%
2	2	$146.94	1%
3	3	$2.86	37%
4	5	($947.04)	65%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.27 Average LCC and PBP Results for C-RC&RC-A (≥800 and <4,000)

TSL	Efficiency Level	Average Costs *2022$*				Simple Payback *years*	Average Lifetime *years*
		Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC		
--	Baseline					--	
1	1	$9,473.02	$1,730.38	$12,298.17	$21,771.19	2.3	8.5
2	2	$9,579.89	$1,689.56	$12,046.35	$21,626.24	2.5	8.5
3	4	$9,784.36	$1,673.41	$11,934.64	$21,718.64	4.2	8.5
4	5	$10,823.59	$1,653.70	$12,102.60	$22,926.19	12.7	8.5

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

Table V.28 Average LCC Savings Relative to the No-New-Standards Case for C-RC&RC-A (≥800 and <4,000)

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$146.04	1%
2	2	$254.38	3%
3	4	$161.99	20%
4	5	($1,044.87)	66%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.29 Average LCC and PBP Results for C-SC-A (>50 and <149)

TSL	Efficiency Level	Average Costs *2022$* Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC	Simple Payback *years*	Average Lifetime *years*
--	Baseline					--	
1	1	$3,074.63	$571.24	$4,296.49	$7,371.12	5.3	8.5
2	1	$3,074.63	$571.24	$4,296.49	$7,371.12	5.3	8.5
3	1	$3,074.63	$571.24	$4,296.49	$7,371.12	5.3	8.5
4	5	$4,011.26	$559.59	$4,482.64	$8,493.90	64.7	8.5

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

Table V.30 Average LCC Savings Relative to the No-New-Standards Case for C-SC-A (>50 and <149)

TSL	Efficiency Level	Life-Cycle Cost Savings: Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$5.18	29%
2	1	$5.18	29%
3	1	$5.18	29%
4	5	($1,117.62)	93%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers

Table V.31 Average LCC and PBP Results for C-SC-A (≥149 and <700)

TSL	Efficiency Level	Average Costs *2022$* Installed Cost	First Year's Operating Cost	Lifetime Operating Cost	LCC	Simple Payback *years*	Average Lifetime *years*
--	Baseline					--	
1	1	$4,076.50	$674.99	$5,060.46	$9,136.96	4.0	8.5
2	1	$4,076.50	$674.99	$5,060.46	$9,136.96	4.0	8.5
3	2	$4,098.55	$672.28	$5,048.18	$9,146.74	5.7	8.5
4	5	$5,180.53	$647.29	$5,185.51	$10,366.04	35.4	8.5

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

Table V.32 Average LCC Savings Relative to the No-New-Standards Case for C-SC-A (≥149 and <700)

TSL	Efficiency Level	Life-Cycle Cost Savings: Average LCC Savings*, ** *2022$*	Percent of Consumers that Experience Net Cost
1	1	$11.49	8%

TSL	Efficiency Level	Life-Cycle Cost Savings	
		Average LCC Savings*, ** *2022$*	**Percent of Consumers that Experience Net Cost**
2	1	$11.49	8%
3	2	$1.67	42%
4	5	($1,217.84)	90%

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers.

b. Consumer Subgroup Analysis

In the consumer subgroup analysis, DOE estimated the impact of the considered TSLs on two subgroups: (1) lodging and (2) foodservice buildings. Table V.33 through Table V.37 compare the average LCC savings and PBP at each efficiency level for the consumer subgroups with similar metrics for the entire consumer sample for ACIM equipment. In most cases, the average LCC savings and PBP for lodging and foodservice buildings at the considered efficiency levels are not substantially different from all the business sector values.

For the automatic commercial ice makers, DOE has not distinguished between subsectors of the foodservice industry. In other words, DOE has been treating it as one sector as opposed to modeling limited or full-service restaurants and other types of foodservice firms separately.

Foodservice was chosen as one representative subgroup because of the large percentage of the industry represented by family or locally owned restaurants. Likewise, lodging was chosen due to the large percentage of the industry represented by locally owned or franchisee-owned hotels. DOE carried out two LCC subgroup analyses, one each for foodservice and lodging, by using the LCC spreadsheet described in chapter 8 of this NOPR, but with certain modifications. The input for business type was fixed to the identified subgroup, which ensured that the discount rates and electricity price rates associated with only that subgroup were selected in the Monte Carlo simulations (see chapter 8 of the NOPR TSD). Another major change from the LCC analysis was an added assumption that the subgroups do not have access to national capital markets, which results in higher discount rates for the subgroups. The higher discount rates lead the subgroups to value more highly upfront equipment purchase costs relative to the future operating cost savings.

Table V.33 presents the comparison of mean LCC savings for the foodservice sector subgroup with the national average values (LCC savings results from chapter 8 of the NOPR TSD). For all TSLs in all equipment classes, the LCC savings for the small business subgroup are lower than the national average values. Table V.34 presents the percentage of consumers that experience net cost compared to national average values. DOE modeled all equipment classes in this analysis, although DOE believes it is likely that the very large equipment classes are not commonly used in foodservice establishments. Table V.35 presents the comparison of median PBPs for the foodservice sector subgroup with national median values (median PBPs from chapter 8 of the NOPR TSD). The PBP values are longer for the foodservice sector subgroup in all cases. This arises because the first-year operating cost savings—which are used for payback period—are slightly lower leading to a longer payback, but given their higher discount rates, these consumers value future savings less, leading to lower LCC savings.

Table V.36 presents the comparison of mean LCC savings for the lodging sector subgroup (hotels and casinos) with the national average values (LCC savings results from chapter 8 of the NOPR TSD). For lodging sector small business, LCC savings are lower across the board. The reason for this is that the energy price for lodging is slightly lower than the average of all commercial business types (97 percent of the average). This lower energy price combined with a higher discount rate reduces the nominal value of future operating and maintenance benefits as well as the present value of the benefits, thus resulting in lower LCC savings. Table V.37 presents the percentage of consumers that experience net cost of the lodging sector consumer subgroup compared to national average values.

Table V.38 presents the comparison of median PBPs for the lodging sector subgroup with national median values (median PBPs from chapter 8 of the NOPR TSD). The PBP values are slightly higher in the lodging subgroup in all instances. As noted above, the energy savings would be lower in nominal terms than a national average. Thus, the slightly lower median PBP appears to be a result of a narrower electricity saving results distribution that is close to but below the national average.

Table V.33 Comparison of Average LCC Savings for the Foodservice Sector Subgroup with the National Average Values

Equipment Class	Category	Average LCC Savings *2022$**, **			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	Foodservice Sector	$0.00	$0.00	$0.00	($310.25)
	All Business Types	$0.00	$0.00	$0.00	($307.99)
B-IMH-W (≥785 and <1,500)	Foodservice Sector	$0.00	$0.00	$0.00	($254.57)

Equipment Class	Category	Average LCC Savings *2022$*, **			
		TSL 1	TSL 2	TSL 3	TSL 4
	All Business Types	$0.00	$0.00	$0.00	($249.33)
B-IMH-A (≥300 and <727)	Foodservice Sector	$24.41	$19.46	$19.46	($318.89)
	All Business Types	$25.63	$29.18	$21.54	($315.79)
B-IMH-A (≥727 and <1,500)	Foodservice Sector	$190.01	$291.43	$222.05	($45.44)
	All Business Types	$194.60	$300.78	$232.02	($30.90)
B-RC(NRC)-A (≥988 and <4,000)	Foodservice Sector	$88.99	$88.99	$31.92	($223.54)
	All Business Types	$93.15	$93.15	$36.86	($215.49)
B-SC-A (Portable ACIM) (≤38)	Foodservice Sector	$0.77	$1.22	$1.22	($3.91)
	All Business Types	$0.81	$1.29	$1.29	($3.83)
B-SC-A (Refrigerated Storage ACIM)	Foodservice Sector	$1.42	$3.15	$3.15	($4.14)
	All Business Types	$1.46	$3.25	$3.25	($4.04)
B-SC-A (<=50)	Foodservice Sector	$7.19	$7.19	$7.19	($474.50)
	All Business Types	$7.98	$7.98	$7.98	($474.08)
B-SC-A (>50 and <134)	Foodservice Sector	$0.00	$0.00	$0.00	($472.22)
	All Business Types	$0.00	$0.00	$0.00	($470.21)
B-SC-A (≥200 and <4,000)	Foodservice Sector	$41.03	$63.33	$16.92	($387.02)
	All Business Types	$42.62	$66.71	$20.81	($382.22)
C-IMH-W (>50 and <801)	Foodservice Sector	$0.00	$0.00	$0.00	($1,191.35)
	All Business Types	$0.00	$0.00	$0.00	($1,187.75)
C-IMH-A (≥310 and <820)	Foodservice Sector	$141.26	$142.85	($3.88)	($952.71)
	All Business Types	$144.89	$146.94	$2.86	($947.04)
C-RC&RC-A (≥800 and <4,000)	Foodservice Sector	$141.59	$246.19	$151.76	($1,054.67)
	All Business Types	$146.04	$254.38	$161.99	($1,044.87)
C-SC-A (>50 and <149)	Foodservice Sector	$4.77	$4.77	$4.77	($1,116.89)
	All Business Types	$5.18	$5.18	$5.18	($1,117.62)
C-SC-A (≥149 and <700)	Foodservice Sector	$11.00	$11.00	$0.90	($1,218.67)
	All Business Types	$11.49	$11.49	$1.67	($1,217.84)

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers.

Table V.34 Percentage of Consumers Experiencing Net Cost for the Foodservice Sector Subgroup

Equipment Class	Category	Percentage Net Cost %			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	Foodservice Sector	0%	0%	0%	49%
	All Business Types	0%	0%	0%	49%
B-IMH-W (≥785 and <1,500)	Foodservice Sector	0%	0%	0%	83%
	All Business Types	0%	0%	0%	82%
B-IMH-A (≥300 and <727)	Foodservice Sector	4%	16%	16%	66%
	All Business Types	4%	6%	16%	66%
B-IMH-A (≥727 and <1,500)	Foodservice Sector	0%	3%	18%	66%
	All Business Types	0%	3%	18%	64%
B-RC(NRC)-A (≥988 and <4,000)	Foodservice Sector	3%	3%	10%	51%
	All Business Types	3%	3%	10%	51%
B-SC-A (Portable ACIM) (≤38)	Foodservice Sector	8%	12%	12%	84%
	All Business Types	8%	12%	12%	84%
B-SC-A (Refrigerated Storage ACIM)	Foodservice Sector	0%	0%	0%	87%
	All Business Types	0%	0%	0%	86%
B-SC-A (<=50)	Foodservice Sector	12%	12%	12%	90%
	All Business Types	11%	11%	11%	90%
B-SC-A (>50 and <134)	Foodservice Sector	0%	0%	0%	79%
	All Business Types	0%	0%	0%	79%
B-SC-A (≥200 and <4,000)	Foodservice Sector	6%	16%%	48%	95%
	All Business Types	5%	15%	46%	95%
C-IMH-W (>50 and <801)	Foodservice Sector	0%	0%	0%	91%
	All Business Types	0%	0%	0%	91%
C-IMH-A (≥310 and <820)	Foodservice Sector	0%	1%	38%	65%
	All Business Types	0%	1%	37%	65%
C-RC&RC-A (≥800 and <4,000)	Foodservice Sector	1%	3%	21%	66%
	All Business Types	1%	3%	20%	66%
C-SC-A (>50 and <149)	Foodservice Sector	31%	31%	31%	93%
	All Business Types	29%	29%	29%	93%
C-SC-A (≥149 and <700)	Foodservice Sector	8%	8%	43%	90%
	All Business Types	8%	8%	42%	90%

Table V.35 Comparison of Median Payback Periods for the Foodservice Sector Subgroup with National Median Values

Equipment Class	Category	Median Payback Period *years**			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	Foodservice Sector	0.0	0.0	0.0	25.0
	All Business Types	0.0	0.0	0.0	24.7
B-IMH-W (≥785 and <1,500)	Foodservice Sector	0.0	0.0	0.0	13.2
	All Business Types	0.0	0.0	0.0	13.0
B-IMH-A (≥300 and <727)	Foodservice Sector	3.4	4.5	4.5	14.4
	All Business Types	3.4	4.1	4.5	14.3
B-IMH-A (≥727 and <1,500)	Foodservice Sector	1.3	2.4	3.4	6.5
	All Business Types	1.3	2.4	3.4	6.4
B-RC(NRC)-A (≥988 and <4,000)	Foodservice Sector	3.2	3.2	5.2	8.9
	All Business Types	3.2	3.2	5.2	8.8
B-SC-A (Portable ACIM) (≤38)	Foodservice Sector	3.3	3.9	3.9	9.7
	All Business Types	3.3	3.8	3.8	9.6
B-SC-A (Refrigerated Storage ACIM)	Foodservice Sector	2.3	2.1	2.1	9.2
	All Business Types	2.3	2.1	2.1	9.1
B-SC-A (<=50)	Foodservice Sector	5.7	5.7	5.7	43.9
	All Business Types	5.7	5.7	5.7	43.7
B-SC-A (>50 and <134)	Foodservice Sector	0.0	0.0	0.0	31.5
	All Business Types	0.0	0.0	0.0	31.2
B-SC-A (≥200 and <4,000)	Foodservice Sector	3.5	4.4	6.1	15.8
	All Business Types	3.5	4.4	6.0	15.7
C-IMH-W (>50 and <801)	Foodservice Sector	0.0	0.0	0.0	22.2
	All Business Types	0.0	0.0	0.0	22.0
C-IMH-A (≥310 and <820)	Foodservice Sector	1.4	1.9	4.9	14.3
	All Business Types	1.4	1.9	4.8	14.1
C-RC&RC-A (≥800 and <4,000)	Foodservice Sector	2.3	2.5	4.3	12.8
	All Business Types	2.3	2.5	4.2	12.7
C-SC-A (>50 and <149)	Foodservice Sector	5.3	5.3	5.3	65.3
	All Business Types	5.3	5.3	5.3	64.7
C-SC-A (≥149 and <700)	Foodservice Sector	4.0	4.0	5.7	35.7
	All Business Types	4.0	4.0	5.7	35.4

*Values in parentheses are negative numbers.

Table V.36 Comparison of Average LCC Savings for the Lodging Sector Subgroup with the National Average Values

Equipment Class	Category	Average LCC Savings *2022$*, **			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	Lodging Sector	$0.00	$0.00	$0.00	($310.79)
	All Business Types	$0.00	$0.00	$0.00	($307.99)
B-IMH-W (≥785 and <1,500)	Lodging Sector	$0.00	$0.00	$0.00	($255.39)
	All Business Types	$0.00	$0.00	$0.00	($249.33)
B-IMH-A (≥300 and <727)	Lodging Sector	$24.30	$19.29	$19.29	($319.25)
	All Business Types	$25.63	$29.18	$21.54	($315.79)
B-IMH-A (≥727 and <1,500)	Lodging Sector	$189.36	$290.07	$220.62	($47.47)
	All Business Types	$194.60	$300.78	$232.02	($30.90)
B-RC(NRC)-A (≥988 and <4,000)	Lodging Sector	$88.50	$88.50	$31.36	($224.66)
	All Business Types	$93.15	$93.15	$36.86	($215.49)
B-SC-A (Portable ACIM) (≤38)	Lodging Sector	$0.77	$1.21	$1.21	($3.93)
	All Business Types	$0.81	$1.29	$1.29	($3.83)
B-SC-A (Refrigerated Storage ACIM)	Lodging Sector	$1.41	$3.14	$3.14	($4.16)
	All Business Types	$1.46	$3.25	$3.25	($4.04)
B-SC-A (<=50)	Lodging Sector	$7.19	$7.19	$7.19	($474.54)
	All Business Types	$7.98	$7.98	$7.98	($474.08)
B-SC-A (>50 and <134)	Lodging Sector	$0.00	$0.00	$0.00	($472.54)
	All Business Types	$0.00	$0.00	$0.00	($470.21)
B-SC-A (≥200 and <4,000)	Lodging Sector	$40.81	$62.87	$16.39	($387.69)
	All Business Types	$42.62	$66.71	$20.81	($382.22)
C-IMH-W (>50 and <801)	Lodging Sector	$0.00	$0.00	$0.00	($1,192.25)
	All Business Types	$0.00	$0.00	$0.00	($1,187.75)
C-IMH-A (≥310 and <820)	Lodging Sector	$140.59	$142.11	($5.05)	($953.91)
	All Business Types	$144.89	$146.94	$2.86	($947.04)
C-RC&RC-A (≥800 and <4,000)	Lodging Sector	$141.24	$245.41	$150.79	($1,056.10)
	All Business Types	$146.04	$254.38	$161.99	($1,044.87)
C-SC-A (>50 and <149)	Lodging Sector	$4.71	$4.71	$4.71	($1,117.03)
	All Business Types	$5.18	$5.18	$5.18	($1,117.62)
C-SC-A (≥149 and <700)	Lodging Sector	$10.93	$10.93	$0.79	($1,219.08)
	All Business Types	$11.49	$11.49	$1.67	($1,217.84)

*Values in parentheses are negative numbers.
** The savings represent the average LCC for affected consumers.

Table V.37 Percentage of Consumers Experiencing Net Cost for the Lodging Sector Subgroup

Equipment Class	Category	Percentage Net Cost %			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	Lodging Sector	0%	0%	0%	49%
	All Business Types	0%	0%	0%	49%
B-IMH-W (≥785 and <1,500)	Lodging Sector	0%	0%	0%	83%
	All Business Types	0%	0%	0%	82%

Equipment Class	Category	Percentage Net Cost %			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-A (≥300 and <727)	Lodging Sector	4%	16%	16%	66%
	All Business Types	4%	6%	16%	66%
B-IMH-A (≥727and <1,500)	Lodging Sector	0%	3%	19%	66%
	All Business Types	0%	3%	18%	64%
B-RC(NRC)-A (≥988 and <4,000)	Lodging Sector	3%	3%	10%	51%
	All Business Types	3%	3%	10%	51%
B-SC-A (Portable ACIM) (≤38)	Lodging Sector	8%	13%	13%	85%
	All Business Types	8%	12%	12%	84%
B-SC-A (Refrigerated Storage ACIM)	Lodging Sector	0%	0%	0%	87%
	All Business Types	0%	0%	0%	86%
B-SC-A (<=50)	Lodging Sector	12%	12%	12%	90%
	All Business Types	11%	11%	11%	90%
B-SC-A (>50 and <134)	Lodging Sector	0%	0%	0%	79%
	All Business Types	0%	0%	0%	79%
B-SC-A (≥200 and <4,000)	Lodging Sector	6%	16%	48%	95%
	All Business Types	5%	15%	46%	95%
C-IMH-W (>50 and <801)	Lodging Sector	0%	0%	0%	91%
	All Business Types	0%	0%	0%	91%
C-IMH-A (≥310 and <820)	Lodging Sector	0%	1%	38%	65%
	All Business Types	0%	1%	37%	65%
C-RC&RC-A (≥800 and <4,000)	Lodging Sector	1%	3%	20%	66%
	All Business Types	1%	3%	20%	66%
C-SC-A (>50 and <149)	Lodging Sector	31%	31%	31%	93%
	All Business Types	29%	29%	29%	93%
C-SC-A (≥149 and <700)	Lodging Sector	8%	8%	43%	90%
	All Business Types	8%	8%	42%	90%

Table V.38 Comparison of Median Payback Periods for the Lodging Sector Subgroup with National Median Values

Equipment Class	Category	Median Payback Period *years**			
		TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)	Lodging Sector	0.0	0.0	0.0	25.0
	All Business Types	0.0	0.0	0.0	24.7
B-IMH-W (≥785 and <1,500)	Lodging Sector	0.0	0.0	0.0	13.2
	All Business Types	0.0	0.0	0.0	13.0
B-IMH-A (≥300 and <727)	Lodging Sector	3.4	4.5	4.5	14.5
	All Business Types	3.4	4.1	4.5	14.3
B-IMH-A (≥727 and <1,500)	Lodging Sector	1.3	2.4	3.4	6.5
	All Business Types	1.3	2.4	3.4	6.4
B-RC(NRC)-A (≥988 and <4,000)	Lodging Sector	3.2	3.2	5.2	8.9
	All Business Types	3.2	3.2	5.2	8.8
B-SC-A (Portable ACIM) (≤38)	Lodging Sector	3.3	3.9	3.9	9.7

Equipment Class	Category	Median Payback Period *years**			
		TSL 1	TSL 2	TSL 3	TSL 4
	All Business Types	3.3	3.8	3.8	9.6
B-SC-A (Refrigerated Storage ACIM)	Lodging Sector	2.3	2.1	2.1	9.2
	All Business Types	2.3	2.1	2.1	9.1
B-SC-A (<=50)	Lodging Sector	5.8	5.8	5.8	43.9
	All Business Types	5.7	5.7	5.7	43.7
B-SC-A (>50 and <134)	Lodging Sector	0.0	0.0	0.0	31.6
	All Business Types	0.0	0.0	0.0	31.2
B-SC-A (≥200 and <4,000)	Lodging Sector	3.5	4.4	6.1	15.8
	All Business Types	3.5	4.4	6.0	15.7
C-IMH-W (>50 and <801)	Lodging Sector	0.0	0.0	0.0	22.2
	All Business Types	0.0	0.0	0.0	22.0
C-IMH-A (≥310 and <820)	Lodging Sector	1.4	1.9	4.9	14.3
	All Business Types	1.4	1.9	4.8	14.1
C-RC&RC-A (≥800 and <4,000)	Lodging Sector	2.3	2.5	4.3	12.8
	All Business Types	2.3	2.5	4.2	12.7
C-SC-A (>50 and <149)	Lodging Sector	5.3	5.3	5.3	65.4
	All Business Types	5.3	5.3	5.3	64.7
C-SC-A (≥149 and <700)	Lodging Sector	4.1	4.1	5.8	35.8
	All Business Types	4.0	4.0	5.7	35.4

*Values in parentheses are negative numbers.

Chapter 11 of the NOPR TSD presents the complete LCC and PBP results for the subgroups.

c. Rebuttable Presumption Payback

As discussed in section III.F.2 of this document, EPCA establishes a rebuttable presumption that an energy conservation standard is economically justified if the increased purchase cost for equipment that meets the standard is less than three times the value of the first-year energy savings resulting from the standard. In calculating a rebuttable presumption payback period for each of the considered TSLs, DOE used discrete values and, as required by EPCA, based the energy use calculation on the DOE test procedure for ACIM equipment. In contrast, the PBPs presented in section V.B.1.a of this document were calculated using distributions that reflect the range of energy use in the field.

Table V.39 presents the rebuttable presumption payback periods for the considered TSLs for ACIM equipment. Although DOE examined the rebuttable presumption criterion, DOE also examined whether the standard levels considered in this NOPR are economically justified through a more detailed analysis of the economic impacts of those levels, pursuant to 42 U.S.C. 6295(o)(2)(B)(i), that considers the full range of impacts to the consumer, manufacturer, Nation, and environment. The results of that analysis serve as the basis for DOE to definitively evaluate the economic justification for a potential standard level, thereby supporting or rebutting the results of any preliminary determination of economic justification.

Table V.39 Rebuttable Presumption Payback Periods

Equipment Class	Median Payback Period *years**			
	TSL 1	TSL 2	TSL 3	TSL 4
B-IMH-W (≥300 and <785)				24.7
B-IMH-W (≥785 and <1,500)				13.1
B-IMH-A (≥300 and <727)	3.4	4.5	4.5	14.3
B-IMH-A (≥727 and <1,500)	1.3	2.4	3.4	6.4
B-RC(NRC)-A (≥ 988 and <4,000)	3.2	3.2	5.2	8.8
B-SC-A (Portable ACIM) (≤38)	3.3	3.8	3.8	9.6
B-SC-A (Refrigerated Storage ACIM)	2.3	2.1	2.1	9.1
B-SC-A (<=50)	17.8	17.8	17.8	85.8
B-SC-A (>50 and <134)				31.2
B-SC-A (≥ 200 and <4,000)	3.5	4.4	6.0	15.7
C-IMH-W (>50 and <801)				22.0
C-IMH-A (≥310 and <820)	1.4	1.9	4.8	14.1
C-RC&RC-A (≥800 and <4,000)	2.3	2.5	4.2	12.7
C-SC-A (>50 and <149)	5.3	5.3	5.3	64.7
C-SC-A (≥149 and <700)	4.0	4.0	5.7	35.4

*Values in parentheses are negative numbers.

2. Economic Impacts on Manufacturers

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

a. Industry Cash Flow Analysis Results

In this section, DOE provides GRIM results from the analysis, which examines changes in the industry that would result from a standard. The following tables summarize the estimated financial impacts (represented by changes in INPV) of potential amended energy conservation standards on manufacturers of ACIM equipment, as well as the conversion costs that DOE estimates manufacturers of ACIM equipment would incur at each TSL.

The impact of potential new or amended energy conservation standards was analyzed under two scenarios: (1) the preservation of gross margin percentage; and (2) the preservation of operating profit, as discussed in section IV.J.2.d of this document. The preservation of gross margin percentages applies a "gross margin percentage" of 20 percent for all equipment classes across all efficiency levels.[71] This scenario assumes that a manufacturer's per-unit dollar profit would increase as MPCs increase in the standards cases and represents the upper-bound to industry profitability under potential new or amended energy conservation standards.

The preservation of operating profit scenario reflects manufacturers' concerns about their inability to maintain margins as MPCs increase to reach more stringent

[71] The gross margin percentage of 20 percent is based on manufacturer markups of 1.25.

efficiency levels. In this scenario, while manufacturers make the necessary investments required to convert their facilities to produce compliant equipment, operating profit does not change in absolute dollars and decreases as a percentage of revenue. The preservation of operating profit scenario represents the lower (or more severe) bound to industry profitability under potential new or amended energy conservation standards.

Each of the modeled scenarios resulted in a unique set of cash flows and corresponding INPV for each TSL. INPV is the sum of the discounted cash flows to the industry from the base year through the end of the analysis period (2023–2056). The "change in INPV" results refer to the difference in industry value between the no-new-standards case and standards case at each TSL. To provide perspective on the short-run cash flow impact, DOE includes a comparison of free cash flow between the no-new-standards case and the standards case at each TSL in the year before amended standards would take effect. This figure provides an understanding of the magnitude of the required conversion costs relative to the cash flow generated by the industry in the no-new-standards case.

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

Table V.40 Manufacturer Impact Analysis Results

	Unit	No-New-Standards Case	TSL 1	TSL 2	TSL 3	TSL 4
INPV	*2022$ Million*	96.4	90.8 to 91.5	88.5 to 89.8	82.5 to 84.9	53.4 to 71.8
Change in INPV	*%*	-	(5.8) to (5.1)	(8.2) to (6.8)	(14.4) to (12.0)	(44.6) to (25.5)
Free Cash Flow (2026)	*2022$ Million*	9.4	7.2	6.3	3.7	(2.4)
Change in Free Cash Flow (2026)	*%*	-	(23.5)	(32.8)	(60.9)	(125.4)
Product Conversion Costs	*2022$ Million*	-	4.4	6.5	11.0	20.5
Capital Conversion Costs	*2022$ Million*	-	1.8	2.2	4.9	11.6
Total Conversion Costs	*2022$ Million*	-	6.2	8.7	15.9	32.1

*Parentheses denote negative (-) values.

The following cash flow discussion refers to the equipment classes as detailed in Table IV.5 and Table IV.6 in section IV.C of this document.

At TSL 1, the standard represents EL 1 for all equipment classes that have positive average LCC savings. The change in INPV is expected to range from -5.8 percent to -5.1 percent. At this level, free cash flow is estimated to decrease by 23.5 percent compared to the no-new-standards case value of $9.4 million in the year 2026, the year before the standards year. In 2026, approximately 61 percent of covered ACIM equipment shipments and 40 percent of low-capacity ACIM equipment shipments are expected to meet the efficiencies required at TSL 1.

The design options DOE analyzed for most equipment classes included condenser fan or pump motor efficiency improvements (*e.g.*, switching from a SPM to a PSC motor). The design options analyzed for B-SC-A (≤50) included implementing batch water fill. The design options analyzed for C-SC-A (>50 and <149) and C-SC-A (≥149 and <700) included implementing microchannel condensers. For equipment classes B-IMH-W (≥300 and <785), B-IMH-W (≥785 and <1,500), B-SC-A (>50 and <134), and C-IMH-W (>50 and <801), TSL 1 corresponds to EL 0. For the remaining equipment classes, TSL 1 corresponds to EL 1. Product conversion costs may be necessary for developing, qualifying, sourcing, and testing more efficient components. At this level, capital conversion costs are minimal because most manufacturers can achieve TSL 1 efficiencies with relatively minor component changes. DOE estimates product conversion costs of $4.4 million and capital conversion costs of $1.8 million. Conversion costs total $6.2 million.

At TSL 1, the shipment-weighted average MPC for all automatic commercial ice makers is expected to increase by 0.6 percent relative to the no-new-standards case shipment-weighted average MPC for all automatic commercial ice makers in 2027. In the preservation of gross margin percentage scenario, the minor increase in cashflow from the higher MSP is slightly outweighed by the $6.2 million in conversion costs, causing a small decrease in INPV at TSL 1 under this scenario. Under the preservation of operating profit scenario, manufacturers earn the same per-unit operating profit as would be earned in the no-new-standards case, but manufacturers do not earn additional profit from their investments. In this scenario, the manufacturer markup decreases in 2027, the analyzed compliance year. This reduction in the manufacturer markup and the $6.2 million in conversion costs incurred by manufacturers cause a slightly negative change in INPV at TSL 1 under the preservation of operating profit scenario.

At TSL 2, the standard represents efficiency levels with maximum average LCC savings. The change in INPV is expected to range from -8.2 to -6.8 percent. At this level, free cash flow is estimated to decrease by 32.8 percent compared to the no-new-standards case value of $9.4 million in the year 2026, the year before the standards year. In 2026, approximately 58 percent of covered ACIM equipment shipments and 32 percent of low-capacity ACIM equipment shipments are expected to meet the efficiencies required at TSL 2.

The additional design options analyzed at TSL 2 are similar to the design options analyzed at TSL 1 (*i.e.*, more-efficient condenser fan and/or pump motors, microchannel condensers). For most equipment classes, the design options included implementing additional motor efficiency improvements as compared to TSL 1 (*e.g.*, switching from a PSC motor to an ECM). The design options analyzed for C-IMH-A (≥310 and <820) included implementing microchannel condensers. For equipment classes B-IMH-A (≥300 and <727), B-IMH-A (≥727 and <1,500), B-SC-A (Portable <38), B-SC-A (Refrigerated Storage), B-SC-A (≥200 and <4,000), C-IMH-A (≥310 and <820), and C-RC&RC-A (≥800 and <4,000), TSL 2 corresponds to EL 2. For the remaining equipment classes, the efficiencies required at TSL 2 are the same as TSL 1. At this level, product conversion costs may be necessary for developing, qualifying, sourcing, and testing higher efficiency components. At TSL 2, the majority of redesigns still rely on switching to higher efficiency motors, but a limited number of units are expected to require more complex system redesigns of the condenser. Capital conversion costs may be necessary for incremental updates in tooling. DOE estimates product conversion costs of $6.5 million and capital conversion costs of $2.2 million. Conversion costs total $8.7 million.

At TSL 2, the shipment-weighted average MPC for all automatic commercial ice makers is expected to increase by 1.3 percent relative to the no-new-standards case shipment-weighted average MPC for all automatic commercial ice makers in 2027. In the preservation of gross margin percentage scenario, the minor increase in cashflow from the higher MSP is outweighed by the $8.7 million in conversion costs, causing a decrease in INPV at TSL 2 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2027, the analyzed compliance year. This reduction in the manufacturer markup and the $8.7 million in conversion costs incurred by manufacturers cause a negative change in INPV at TSL 2 under the preservation of operating profit scenario.

At TSL 3, the standard represents the maximum efficiency level with a positive average LCC savings. The change in INPV is expected to range from -14.4 to -12.0 percent. At this level, free cash flow is estimated to decrease by 60.9 percent compared to the no-new-standards case value of $9.4 million in the year 2026, the year before the standards year. In 2026, approximately 52 percent of covered ACIM equipment shipments and 32 percent of low-capacity ACIM equipment shipments are expected to meet the efficiencies required at TSL 3.

At TSL 3, DOE expects more widespread use of higher efficiency motors and microchannel condensers as compared to TSL 1 and TSL 2. For example, meeting the efficiencies required by TSL 3 would require some manufacturers to implement both higher efficiency fan motors (air-cooled only) and higher efficiency pump (batch only) or auger motors (continuous only). In addition, DOE expects the majority of equipment classes (air-cooled only) would need to incorporate microchannel condensers into their ACIM equipment designs. At TSL 3, the additional design options analyzed for B-IMH-

A (≥727 and <1,500), B-RC(NRC)-A (≥988 and <4,000), B-SC-A (≥200 and <4,000), and C-RC&RC-A (≥800 and <4,000) included implementing microchannel condensers. The additional design options analyzed for C-RC&RC-A (≥800 and <4,000) also included an increase in condenser width. For equipment classes B-IMH-A (≥727 and <1,500), B-SC-A (≥200 and <4,000), and C-RC&RC-A (≥800 and <4,000) TSL 3 corresponds to EL 4. For B-RC(NRC)-A (≥988 and <4,000) and C-SC-A (≥149 and <700), TSL 3 corresponds to EL 2. For C-IMH-A (≥310 and <820), TSL 3 corresponds to EL 3. For the remaining equipment classes, the efficiencies required at TSL 3 are the same as TSL 2. Product conversion costs may be necessary for developing, qualifying, sourcing, and testing higher efficiency components. At TSL 3, some redesigns still rely on switching to higher efficiency components, but most automatic commercial ice makers are expected to require more complex system redesigns of the condenser. DOE estimates product conversion costs of $11.0 million and capital conversion costs of $4.9 million. Conversion costs total $15.9 million.

At TSL 3, the shipment-weighted average MPC for all automatic commercial ice makers is expected to increase by 2.2 percent relative to the no-new-standards case shipment-weighted average MPC for all automatic commercial ice makers in 2027. In the preservation of gross margin percentage scenario, the increase in cashflow from the higher MSP is outweighed by the $15.9 million in conversion costs, causing a decrease in INPV at TSL 3 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2027, the analyzed compliance year. This reduction in the manufacturer markup and the $15.9 million in conversion costs incurred by manufacturers cause a loss in INPV at TSL 3 under the preservation of operating profit scenario.

At TSL 4, the standard represents max-tech for all equipment classes. The change in INPV is expected to range from -44.6 to -25.5 percent. At this level, free cash flow is estimated to decrease by 125.4 percent compared to the no-new-standards case value of $9.4 million in the year 2026, the year before the standards year. In 2026, approximately 24 percent of covered ACIM equipment shipments and 10 percent of low-capacity ACIM equipment shipments are expected to meet the efficiencies required at TSL 4.

At max-tech levels, manufacturers would likely need to implement ECM condenser fan motors (air-cooled only), ECM pump motors (batch only), or ECM auger motors (continuous only) in all of their ACIM equipment designs. All analyzed air-cooled equipment classes would likely require the use of microchannel condensers to meet max-tech. The design options analyzed for all batch equipment classes included drain water heat exchangers. Additionally, DOE expects that manufacturers of B-RC(NRC)-A (≥988 and <4,000) would likely need to increase the size of the condenser. Product conversion costs may be necessary for developing, qualifying, sourcing, and testing more higher efficiency components. At TSL 4, most automatic commercial ice makers are expected to require more complex system redesigns of the condenser. Updating product lines to incorporate microchannel condensers would likely necessitate new tooling and additional design effort as manufacturers would need to obtain samples from suppliers, build pilot units, and conduct iterative testing for each basic model. Increasing the size of the condenser would likely require new tooling and fixtures and significant development time as larger condensers could require a bigger base and updated chassis design. DOE estimates product conversion costs of $20.5 million and capital conversion costs of $11.6 million. Conversion costs total $32.1 million.

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

At TSL 4, the shipment-weighted average MPC for all automatic commercial ice makers is expected to increase by 18.2 percent relative to the no-new-standards case shipment-weighted average MPC for all automatic commercial ice makers in 2027. In the preservation of gross margin percentage scenario, the increase in cashflow from the higher MSP is outweighed by the $32.1 million in conversion costs, causing a large decrease in INPV at TSL 4 under this scenario. Under the preservation of operating profit scenario, the manufacturer markup decreases in 2027, the analyzed compliance year. This reduction in the manufacturer markup and the $32.1 million in conversion costs incurred by manufacturers, cause a significant loss in INPV at TSL 4 under the preservation of operating profit scenario.

DOE seeks comments, information, and data on the capital conversion costs and product conversion costs estimated for each TSL.

b. Direct Impacts on Employment

To quantitatively assess the potential impacts of amended energy conservation standards on direct employment in the ACIM equipment industry, DOE used the GRIM to estimate the domestic labor expenditures and number of direct employees in the no-new-standards case and in each of the standards cases during the analysis period. DOE calculated these values using statistical data from the 2021 *ASM*,[72] BLS employee compensation data,[73] results of the engineering analysis, and manufacturer interviews.

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

Total production employees was then multiplied by the U.S. labor percentage to convert total production employment to total domestic production employment. The U.S. labor percentage represents the industry fraction of domestic manufacturing production capacity for the covered equipment. This value is derived from manufacturer interviews, product database analysis, DOE's shipments analysis, and publicly available information. DOE estimates that approximately 72 percent of currently covered automatic commercial

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[72] U.S. Census Bureau, *Annual Survey of Manufactures*. "Summary Statistics for Industry Groups and Industries in the U.S (2021)." Available at *www.census.gov/data/tables/time-series/econ/asm/2018-2021-asm.html* (last accessed January 20, 2023).

[73] U.S. Bureau of Labor Statistics. *Employer Costs for Employee Compensation*. December 15, 2022. Available at *www.bls.gov/news.release/pdf/ecec.pdf* (last accessed January 20, 2023).

ice makers and 8 percent of the proposed low-capacity automatic commercial ice makers are produced domestically.

The domestic production employees estimate covers production line workers, including line supervisors, who are directly involved in fabricating and assembling products within the OEM facility. Workers performing services that are closely associated with production operations, such as materials handling tasks using forklifts, are also included as production labor.[74] DOE's estimates only account for production workers who manufacture the specific equipment covered by this proposed rule.

Non-production workers account for the remainder of the direct employment figure. The non-production employees category covers domestic workers who are not directly involved in the production process, such as sales, engineering, human resources, management, *etc.*[75] Using the number of domestic production workers calculated above, non-production domestic employees are extrapolated by multiplying the ratio of non-production workers in the industry compared to production employees. DOE assumes that this employee distribution ratio remains constant between the no-new-standards case and standards cases.

Using the GRIM, DOE estimates in the absence of new energy conservation standards there would be 549 domestic workers for automatic commercial ice makers in 2027. Table V.41 shows the range of the impacts of energy conservation standards on

[74] U.S. Census Bureau, "Definitions and Instructions for the Annual Survey of Manufactures, MA-10000." Available at: *www2.census.gov/programs-surveys/asm/technical-documentation/questionnaire/2021/instructions/MA_10000_Instructions.pdf* (last accessed January 25, 2023).
[75] *Id.*

U.S. manufacturing employment in the ACIM equipment industry. The discussion below provides a qualitative evaluation of the range of potential impacts presented in the table.

Table V.41 Direct Employment Impacts for Domestic ACIM Equipment Manufacturers in 2027*

	No-New-Standards Case	Trial Standard Level			
		1	2	3	4
Direct Employment in 2027 (Production Workers + Non-Production Workers)	549	549	548	548	541
Potential Changes in Direct Employment in 2027 *	-	(403) to 0	(403) to (1)	(403) to (1)	(403) to (8)

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

The direct employment impacts shown in Table V.41 represent the potential domestic employment changes that could result following the compliance date for the automatic commercial ice makers in this proposal. The upper bound estimate corresponds to a potential change in the number of domestic workers that would result from amended energy conservation standards if manufacturers continue to produce the same scope of covered equipment within the United States after compliance takes effect.

To establish a conservative lower bound, DOE assumes all manufacturers would shift production to foreign countries with lower labor costs. At lower TSLs (*i.e.*, TSL 1 through TSL 3), DOE believes the likelihood of changes in production location due to amended standards are low due to the relatively minor production line updates required. However, at max-tech, as both the complexity and cost of production updates increases, manufacturers are more likely to revisit their production location decisions.

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

c. Impacts on Manufacturing Capacity

Manufacturers raised concerns about technical resource constraints due to overlapping regulations. When considering potential new and amended energy conservation standards in isolation, the majority of ACIM equipment manufacturers interviewed stated that energy conservation standards that do not change the fundamental assembly of the equipment would not significantly affect manufacturers' production capacities. However, nearly all manufacturers interviewed noted that they may face resource constraints should EPA finalize its proposals in the December 2022 EPA NOPR and DOE set more stringent standards that necessitate the redesign of the majority of basic models. These manufacturers stated that meeting EPA's proposed refrigerant regulation would take significant amounts of engineering time and capital investment.

Based on manufacturer feedback from confidential interviews and publicly available information, DOE expects the ACIM equipment industry would need to invest approximately $30 million over a two-year time period (2023–2024) to redesign models for alternative refrigerants and retrofit manufacturing facilities to accommodate flammable refrigerants in order to comply with EPA's proposal. Should amended standards require significant product development or capital investment, manufacturers stated that the 3-year period between the announcement of the final rule and the compliance date of the amended energy conservation standard might be insufficient to complete the dual development needed to meet both EPA and DOE regulations.

DOE seeks comment on whether manufacturers expect that manufacturing capacity constraints or engineering resource constraints would limit equipment availability to consumers in the timeframe of the new or amended standard compliance date (2027).

d. Impacts on Subgroups of Manufacturers

Small business, low volume, and niche equipment manufacturers, and manufacturers exhibiting a cost structure substantially different from the industry average could be affected disproportionately. As discussed in section IV.J of this document, using average cost assumptions to develop an industry cash flow estimate is inadequate to assess differential impacts among manufacturer subgroups.

For automatic commercial ice makers, DOE identified and evaluated the impact of amended energy conservation standards on one subgroup: small manufacturers. The SBA defines a "small business" as having 1,250 employees or less for NAICS 333415, "Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing," which includes ice-making machinery manufacturing. Based on this definition, DOE identified one domestic OEM in the ACIM equipment industry that qualifies as a "small business."

For a discussion of the impacts on the small manufacturer subgroup, *see* the regulatory flexibility analysis in section VI.B of this document or chapter 12 of the NOPR TSD.

e. Cumulative Regulatory Burden

One aspect of assessing manufacturer burden involves looking at the cumulative impact of multiple DOE standards and the equipment-specific regulatory actions of other

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

Table V.42 Compliance Dates and Expected Conversion Expenses of Federal Energy Conservation Standards Affecting ACIM Equipment OEMs

Federal Energy Conservation Standard	Number of OEMs*	Number of OEMs Affected from Today's Rule**	Approx. Standards Year	Industry Conversion Costs *millions $*	Industry Conversion Costs/Product Revenue***
Consumer Clothes Dryers† 87 FR 51734 (August 23, 2022)	15	1	2027	$149.7 (2020$)	1.8%
Microwave Ovens† 87 FR 52282 (August 24, 2022)	18	2	2026	$46.1 (2021$)	0.7%
Consumer Conventional Cooking Products 88 FR 6818† (February 1, 2023)	34	3	2027	$183.4 (2021$)	1.2%
Residential Clothes Washers 88 FR 13520† (March 3, 2023)	19	1	2027	$690.8 (2021$)	5.2%
Refrigerators, Freezers, and Refrigerator-Freezers 88 FR 12452† (February 27, 2023)	49	4	2027	$1,323.6 (2021$)	3.8%
Miscellaneous Refrigeration Products 88 FR 19382† (March 31, 2023)	38	2	2029	$126.9 (2021$)	3.1%
Consumer Pool Heaters‡	20	1	2028	$48.4 (2021$)	1.5%

* This column presents the total number of OEMs identified in the energy conservation standard rule contributing to cumulative regulatory burden.
** This column presents the number of OEMs producing automatic commercial ice makers that are also listed as OEMs in the identified energy conservation standard contributing to cumulative regulatory burden.
*** This column presents industry conversion costs as a percentage of product revenue during the conversion period. Industry conversion costs are the upfront investments manufacturers must make to sell compliant products/equipment. The revenue used for this calculation is the revenue from just the covered product/equipment associated with each row. The conversion period is the time frame over which conversion costs are made and lasts from the publication year of the final rule to the compliance year of the final rule. The conversion period typically ranges from 3 to 5 years, depending on the energy conservation standard.
† These rulemakings are in the NOPR stage and all values are subject to change until finalized.
‡ At the time of issuance of this ACIM equipment proposed rule, this rulemaking has been issued and is pending publication in the *Federal Register*. Once published, the consumer pool heaters final rule will be available at: www.regulations.gov/docket/EERE-2021-BT-STD-0020 .

Other Federal Regulations

The December 2022 EPA NOPR[76] rulemaking proposes to restrict the use of hydrofluorocarbons in specific sectors or subsectors, including use in automatic commercial ice makers. DOE is considering the impacts of change in refrigerants in its

[76] The proposed rule was published on December 15, 2022. 87 FR 76738.

analysis. See section IV.C.1.a of this document for a full discussion. DOE understands that switching from non-flammable to flammable refrigerants (*e.g.*, R-290) requires time and investment to redesign ACIM equipment models and upgrade production facilities to accommodate the additional structural and safety precautions required. As discussed in section IV.C.1 of this document, DOE expects ACIM equipment manufacturers will transition most models to R-290 or R-600a to comply with anticipated refrigeration regulations, such as the December 2022 EPA NOPR, prior to the expected 2027 compliance date of any potential energy conservation standards. As discussed in section IV.C.1 of this document, DOE expects ACIM equipment manufacturers will transition most models[77] to R-290 or R-600a to comply with anticipated refrigeration regulations, such as the December 2022 EPA NOPR, prior to the expected 2027 compliance date of any potential energy conservation standards. Therefore, the engineering analysis assumes the use of R-290 or R-600a compressors as a baseline design option for most equipment classes. See section IV.C.1 of this document for additional information on refrigerant assumptions in the engineering analysis.

DOE accounted for the costs associated with redesigning automatic commercial ice makers to make use of flammable refrigerants and retrofitting production facilities to accommodate flammable refrigerants in the GRIM. DOE relied on manufacturer feedback in confidential interviews and a report prepared for EPA[78] to estimate the industry refrigerant transition costs. Based on feedback, DOE assumed that the transition to low-GWP refrigerants would require industry to invest approximately $8.8 million in

[77] Specifically, all models of automatic commercial ice makers with harvest rates of up to 1,500 lb ice/24 h with non-remote condensers.

[78] *See* pp. 5–113 of the "Global Non-CO2 Greenhouse Gas Emission Projections & Marginal Abatement Cost Analysis: Methodology Documentation" (2019). Available at *www.epa.gov/sites/default/files/2019-09/documents/nonco2_methodology_report.pdf*.

R&D and $21.2 million in capital expenditures (*e.g.*, investments in new charging equipment, leak detection systems, *etc.*).

DOE requests comments on the magnitude of costs associated with transitioning ACIM equipment models and production facilities to accommodate low-GWP refrigerants, such as R-290, that would be incurred between the publication of this NOPR and the proposed compliance date of new and amended standards. Quantification and categorization of these costs, such as engineering efforts, testing lab time, certification costs, and capital investments (*e.g.*, new charging equipment), would enable DOE to refine its analysis.

DOE requests information regarding the impact of cumulative regulatory burden on manufacturers of automatic commercial ice makers associated with multiple DOE standards or equipment-specific regulatory actions of other Federal agencies.

3. National Impact Analysis

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

a. Significance of Energy Savings

To estimate the energy savings attributable to potential amended standards for ACIM equipment, DOE compared their energy consumption under the no-new-standards case to their anticipated energy consumption under each TSL. The savings are measured over the entire lifetime of equipment purchased in the 30-year period that begins in the year of anticipated compliance with amended standards (2027–2056). Table V.43 presents DOE's projections of the national energy savings for each TSL considered for

ACIM equipment. The savings were calculated using the approach described in section IV.H of this document.

Table V.43 Cumulative National Energy Savings for Automatic Commercial Ice Makers; 30 Years of Shipments (2027–2056)

	Trial Standard Level			
	1	**2**	**3**	**4**
	Quads			
B-IMH-W (≥300 and <785)	0.000	0.000	0.000	0.001
B-IMH-W (≥785 and <1,500)	0.000	0.000	0.000	0.007
B-IMH-A (≥300 and <727)	0.004	0.005	0.010	0.025
B-IMH-A (≥727 and <1,500)	0.028	0.059	0.069	0.102
B-RC(NRC)-A (≥ 988 and <4,000)	0.003	0.003	0.003	0.015
B-SC-A (Portable ACIM) (≤38)	0.003	0.006	0.006	0.008
B-SC-A (Refrigerated Storage ACIM)	0.000	0.001	0.001	0.001
B-SC-A (<=50)	0.003	0.003	0.003	0.011
B-SC-A (>50 and <134)	0.000	0.000	0.000	0.011
B-SC-A (≥ 200 and <4,000)	0.003	0.006	0.007	0.009
C-IMH-W (>50 and <801)	0.000	0.000	0.000	0.004
C-IMH-A (≥310 and <820)	0.007	0.008	0.020	0.025
C-RC&RC-A (≥800 and <4,000)	0.011	0.027	0.033	0.040
C-SC-A (>50 and <149)	0.001	0.001	0.001	0.004
C-SC-A (≥149 and <700)	0.001	0.001	0.001	0.008
Primary Energy	**0.06**	**0.12**	**0.15**	**0.27**
B-IMH-W (≥300 and <785)	0.000	0.000	0.000	0.001
B-IMH-W (≥785 and <1,500)	0.000	0.000	0.000	0.007
B-IMH-A (≥300 and <727)	0.004	0.005	0.010	0.026
B-IMH-A (≥727 and <1,500)	0.029	0.061	0.072	0.106
B-RC(NRC)-A (≥ 988 and <4,000)	0.003	0.003	0.003	0.015
B-SC-A (Portable ACIM) (≤38)	0.003	0.006	0.006	0.008
B-SC-A (Refrigerated Storage ACIM)	0.000	0.001	0.001	0.001
B-SC-A (<=50)	0.003	0.003	0.003	0.011
B-SC-A (>50 and <134)	0.000	0.000	0.000	0.011
B-SC-A (≥ 200 and <4,000)	0.003	0.006	0.007	0.009
C-IMH-W (>50 and <801)	0.000	0.000	0.000	0.004
C-IMH-A (≥310 and <820)	0.007	0.008	0.020	0.026
C-RC&RC-A (≥800 and <4,000)	0.011	0.028	0.034	0.042
C-SC-A (>50 and <149)	0.001	0.001	0.001	0.004
C-SC-A (≥149149 and <700)	0.001	0.001	0.001	0.008
Total FFC Energy	**0.07**	**0.12**	**0.16**	**0.28**

OMB Circular A-4[79] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs. Circular A-4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE

[79] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. *obamawhitehouse.archives.gov/omb/circulars_a004_a-4* (last accessed January 13, 2023).

undertook a sensitivity analysis using 9 years, rather than 30 years, of equipment 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.[80] The review timeframe established in EPCA is generally not synchronized with the equipment lifetime, equipment manufacturing cycles, or other factors specific to ACIM equipment. 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.44. The impacts are counted over the lifetime of ACIM equipment purchased in 2027–2036.

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

Table V.44 Cumulative National Energy Savings for Automatic Commercial Ice Makers; 9 Years of Shipments (2027–2036)

	Trial Standard Level			
	1	**2**	**3**	**4**
	quads			
B-IMH-W (≥300 and <785)	0.000	0.000	0.000	0.000
B-IMH-W (≥785 and <1,500)	0.000	0.000	0.000	0.002
B-IMH-A (≥300 and <727)	0.001	0.001	0.003	0.007
B-IMH-A (≥727 and <1,500)	0.008	0.016	0.019	0.028
B-RC(NRC)-A (≥ 988 and <4,000)	0.001	0.001	0.001	0.004
B-SC-A (Portable ACIM) (≤38)	0.001	0.002	0.002	0.002
B-SC-A (Refrigerated Storage ACIM)	0.000	0.000	0.000	0.000
B-SC-A (<=50)	0.001	0.001	0.001	0.003
B-SC-A (>50 and <134)	0.000	0.000	0.000	0.003
B-SC-A (≥ 200 and <4,000)	0.001	0.002	0.002	0.002
C-IMH-W (>50 and <801)	0.000	0.000	0.000	0.001
C-IMH-A (≥310 and <820)	0.002	0.002	0.005	0.007
C-RC&RC-A (≥800 and <4,000)	0.003	0.007	0.009	0.011
C-SC-A (>50 and <149)	0.000	0.000	0.000	0.001
C-SC-A (≥149 and <700)	0.000	0.000	0.000	0.002
Total Primary Energy	**0.02**	**0.03**	**0.04**	**0.07**
B-IMH-W (≥300 and <785)	0.000	0.000	0.000	0.000
B-IMH-W (≥785 and <1,500)	0.000	0.000	0.000	0.002
B-IMH-A (≥300 and <727)	0.001	0.001	0.003	0.007
B-IMH-A (≥727 and <1,500)	0.008	0.017	0.020	0.029
B-RC(NRC)-A (≥ 988 and <4,000)	0.001	0.001	0.001	0.004
B-SC-A (Portable ACIM) (≤38)	0.001	0.002	0.002	0.002
B-SC-A (Refrigerated Storage ACIM)	0.000	0.000	0.000	0.000
B-SC-A (<=50)	0.001	0.001	0.001	0.003
B-SC-A (>50 and <134)	0.000	0.000	0.000	0.003
B-SC-A (≥ 200 and <4,000)	0.001	0.002	0.002	0.002
C-IMH-W (>50 and <801)	0.000	0.000	0.000	0.001
C-IMH-A (≥310 and <820)	0.002	0.002	0.006	0.007
C-RC&RC-A (≥800 and <4,000)	0.003	0.008	0.009	0.011
C-SC-A (>50 and <149)	0.000	0.000	0.000	0.001
C-SC-A (≥149 and <700)	0.000	0.000	0.000	0.002
Total FFC Energy	**0.02**	**0.03**	**0.04**	**0.08**

b. Significance of Water Savings

To estimate the water savings attributable to potential amended standards for ACIM equipment, DOE compared their water consumption under the no-new-standards case to their anticipated water consumption under each TSL. The savings are measured over the entire lifetime of equipment purchased in the 30-year period that begins in the year of anticipated compliance with amended standards (2027–2056). Table V.45 presents DOE's projections of the national energy savings for each TSL considered for

ACIM equipment. The savings were calculated using the approach described in section IV.H of this document.

Table V.45 Cumulative National Water Savings for Automatic Commercial Ice Makers; 30 Years of Shipments (2027–2056)

	Trial Standard Level			
	1	**2**	**3**	**4**
	Million gallons			
Water savings	6,100	6,100	6,100	6,100

As stated previously, OMB Circular A-4[81] requires agencies to present analytical results, including separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs. Circular A-4 also directs agencies to consider the variability of key elements underlying the estimates of benefits and costs. For this rulemaking, DOE undertook a sensitivity analysis using 9 years, rather than 30 years, of equipment 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.[82] Thus, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology. The NES sensitivity analysis results based on a 9-year analytical period are presented in Table V.46. The impacts are counted over the lifetime of ACIM equipment purchased in 2027–2035.

[81] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. Available at *www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf* (last accessed December 27, 2022).

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

Table V.46 Cumulative National Water Savings for Automatic Commercial Ice Makers; 9 Years of Shipments (2027–2035)

	Trial Standard Level			
	1	2	3	4
	Million gallons			
Water savings	1,600	1,600	1,600	1,600

c. Net Present Value of Consumer Costs and Benefits

DOE estimated the cumulative NPV of the total costs and savings for consumers that would result from the TSLs considered for automatic commercial ice makers. In accordance with OMB's guidelines on regulatory analysis,[83] DOE calculated NPV using both a 7-percent and a 3-percent real discount rate. Table V.47 shows the consumer NPV results with impacts counted over the lifetime of equipment purchased in 2027–2056.

Table V.47 Cumulative Net Present Value of Consumer Benefits for Automatic Commercial Ice Makers; 30 Years of Shipments (2027–2056)

Discount Rate	Trial Standard Level			
	1	2	3	4
	Billion 2022$			
3 percent	0.26	0.47	0.38	(2.67)
7 percent	0.11	0.20	0.14	(1.55)

The NPV results based on the aforementioned 9-year analytical period are presented in Table V.48. The impacts are counted over the lifetime of equipment purchased in 2027–2035. As mentioned previously, such results are presented for informational purposes only and are not indicative of any change in DOE's analytical methodology or decision criteria.

[83] U.S. Office of Management and Budget. *Circular A-4: Regulatory Analysis*. September 17, 2003. *obamawhitehouse.archives.gov/omb/circulars_a004_a-4* (last accessed January 13, 2023).

Table V.48 Cumulative Net Present Value of Consumer Benefits for Automatic Commercial Ice Makers; 9 Years of Shipments (2027–2035)

Discount Rate	Trial Standard Level			
	1	2	3	4
	billion 2022$			
3 percent	0.09	0.16	0.12	(1.12)
7 percent	0.05	0.09	0.06	(0.84)

The previous results reflect the use of a default trend to estimate the change in price for ACIM equipment over the analysis period (*see* section IV.F.1 of this document).

d. Indirect Impacts on Employment

It is estimated that amended energy conservation standards for automatic commercial ice makers would reduce energy expenditures for consumers of that equipment, with the resulting net savings being redirected to other forms of economic activity. These expected shifts in spending and economic activity could affect the demand for labor. As described in section IV.N of this document, DOE used an input/output model of the U.S. economy to estimate indirect employment impacts of the TSLs that DOE considered. There are uncertainties involved in projecting employment impacts, especially changes in the later years of the analysis. Therefore, DOE generated results for near-term timeframes (2027–2032), where these uncertainties are reduced.

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

4. Impact on Utility or Performance of Equipment

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

5. Impact of Any Lessening of Competition

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

6. Need of the Nation to Conserve Energy

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

Energy conservation resulting from potential energy conservation standards for automatic commercial ice makers is expected to yield environmental benefits in the form of reduced emissions of certain air pollutants and greenhouse gases. Table V.49 provides DOE's estimate of cumulative emissions reductions expected to result from the TSLs considered in this rulemaking. The emissions were calculated using the multipliers discussed in section IV.K in this document. DOE reports annual emissions reductions for each TSL in chapter 13 of the NOPR TSD.

Table V.49 Cumulative Emissions Reduction for Automatic Commercial Ice Makers Shipped in 2027–2056

	Trial Standard Level			
	1	**2**	**3**	**4**
Power Sector Emissions				
CO_2 (*million metric tons*)	2.03	3.85	5.00	8.74
CH_4 (*thousand tons*)	0.16	0.30	0.39	0.69
N_2O (*thousand tons*)	0.02	0.04	0.05	0.10
NO_X (*thousand tons*)	1.03	1.96	2.54	4.44
SO_2 (*thousand tons*)	0.98	1.86	2.42	4.22
Hg (*tons*)	0.006	0.012	0.015	0.027
Upstream Emissions				
CO_2 (*million metric tons*)	0.15	0.29	0.38	0.66
CH_4 (*thousand tons*)	14.56	27.63	35.91	62.73
N_2O (*thousand tons*)	0.00	0.00	0.00	0.00
NO_X (*thousand tons*)	2.33	4.43	5.76	10.05
SO_2 (*thousand tons*)	0.01	0.02	0.03	0.05
Hg (*tons*)	0.00002	0.00004	0.00006	0.00010
Total FFC Emissions				
CO_2 (*million metric tons*)	2.18	4.14	5.38	9.40
CH_4 (*thousand tons*)	14.72	27.93	36.30	63.42
N_2O (*thousand tons*)	0.02	0.04	0.06	0.10
NO_X (*thousand tons*)	3.36	6.39	8.30	14.50
SO_2 (*thousand tons*)	0.99	1.88	2.44	4.27
Hg (*tons*)	0.006	0.012	0.015	0.03

As part of the analysis for this rulemaking, DOE estimated monetary benefits likely to result from the reduced emissions of CO_2 that DOE estimated for each of the considered TSLs for ACIM equipment. Section IV.L of this document discusses the SC-CO_2 values that DOE used in its analysis. Table V.50 presents the value of CO_2 emissions reduction at each TSL for each of the SC-CO_2 cases. The time-series of annual values is presented for the proposed TSL in chapter 14 of the NOPR TSD.

Table V.50 Present Value of CO_2 Emissions Reduction for Automatic Commercial Ice Makers Shipped in 2027–2056

TSL	SC-CO_2 Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	Million 2022$			
1	22	95	147	287
2	42	179	279	545
3	55	233	362	708
4	96	407	633	1,237

As discussed in section IV.L.2, DOE estimated the climate benefits likely to result from the reduced emissions of CH_4 and N_2O that DOE estimated for each of the considered TSLs for ACIM equipment. Table V.51 presents the value of the CH_4 emissions reduction at each TSL, and Table V.52 presents the value of the N_2O emissions reduction at each TSL. The time-series of annual values is presented for the proposed TSL in chapter 14 of the NOPR TSD.

Table V.51 Present Value of Methane Emissions Reduction for Automatic Commercial Ice Makers Shipped in 2027–2056

TSL	SC-CH_4 Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2022$			
1	0.6	1.7	2.2	4.4
2	1.0	2.5	3.3	6.6
3	1.7	4.3	5.8	11.4
4	4.4	12.2	16.7	32.2

Table V.52 Present Value of Nitrous Oxide Emissions Reduction for Automatic Commercial Ice Makers Shipped in 2027–2056

TSL	SC-N_2O Case			
	Discount Rate and Statistics			
	5%	3%	2.5%	3%
	Average	Average	Average	95th percentile
	million 2022$			
1	0.01	0.03	0.05	0.08
2	0.01	0.05	0.07	0.12
3	0.02	0.08	0.12	0.21
4	0.06	0.22	0.34	0.59

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 global and U.S. economy continues to evolve rapidly. DOE, together with other Federal agencies, will continue to review methodologies for estimating the monetary value of reductions in CO_2 and other GHG emissions. This ongoing review will consider the comments on this subject that are part of the public record for this and other rulemakings, as well as other methodological assumptions and issues. DOE notes that the proposed standards would be economically justified even without inclusion of monetized benefits of reduced GHG emissions.

DOE also estimated the monetary value of the health benefits associated with NO_X and SO_2 emissions reductions anticipated to result from the considered TSLs for automatic commercial ice makers. The dollar-per-ton values that DOE used are discussed in section IV.L of this document. Table V.53 presents the present value for NO_X emissions reduction for each TSL calculated using 7-percent and 3-percent discount rates, and Table V.54 presents similar results for SO_2 emissions reductions. The results in these tables reflect application of EPA's low dollar-per-ton values, which DOE used to be conservative. The time-series of annual values is presented for the proposed TSL in chapter 14 of the NOPR TSD.

Table V.53 Present Value of NO_X Emissions Reduction for Automatic Commercial Ice Makers Shipped in 2027–2056

TSL	3% Discount Rate	7% Discount Rate
	million 2022$	
1	162	68
2	308	129
3	400	168
4	699	294

Table V.54 Present Value of SO_2 Emissions Reduction for Automatic Commercial Ice Makers Shipped in 2027–2056

TSL	3% Discount Rate	7% Discount Rate
	million 2022$	
1	64	28
2	122	53
3	159	69
4	278	120

Not all the public health and environmental benefits from the reduction of greenhouse gases, NO_x, and SO_2 are captured in the values above, and additional unquantified benefits from the reductions of those pollutants as well as from the reduction of direct PM and other co-pollutants may be significant. DOE has not included monetary benefits of the reduction of Hg emissions because the amount of reduction is very small.

7. Other Factors

The Secretary of Energy, in determining whether a standard is economically justified, may consider any other factors that the Secretary deems to be relevant. (42 U.S.C. 6316(a); 42 U.S.C. 6295(o)(2)(B)(i)(VII)) No other factors were considered in this analysis.

8. Summary of Economic Impacts

Table V.55 presents the NPV values that result from adding the estimates of the potential economic benefits resulting from reduced GHG and NO_X and SO_2 emissions to the NPV of consumer benefits calculated for each TSL considered in this proposed rulemaking. The consumer benefits are domestic U.S. monetary savings that occur as a result of purchasing the covered automatic commercial ice makers and are measured for the lifetime of products shipped in 2027–5056. The climate benefits associated with reduced GHG emissions resulting from the adopted standards are global benefits and are also calculated based on the lifetime of automatic commercial ice makers shipped in 2027–2056.

Table V.55 Consumer NPV Combined with Present Value of Climate Benefits and Health Benefits

Category	TSL 1	TSL 2	TSL 3	TSL 4
Using 3% discount rate for Consumer NPV and Health Benefits (*billion 2022$*)				
5% Average SC-GHG case	0.51	0.94	0.99	(1.60)
3% Average SC-GHG case	0.58	1.08	1.17	(1.28)
2.5% Average SC-GHG case	0.63	1.18	1.30	(1.05)
3% 95th percentile SC-GHG case	0.78	1.45	1.66	(0.43)
Using 7% discount rate for Consumer NPV and Health Benefits (*billion 2022$*)				
5% Average SC-GHG case	0.23	0.42	0.43	(1.03)
3% Average SC-GHG case	0.30	0.56	0.61	(0.71)
2.5% Average SC-GHG case	0.36	0.66	0.74	(0.48)
3% 95th percentile SC-GHG case	0.50	0.93	1.10	0.14

C. Conclusion

When considering new or amended energy conservation standards, the standards that DOE adopts for any type (or class) of covered equipment 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. 6316(a); 42 U.S.C. 6295(o)(2)(A)) In determining whether a standard is economically justified, the Secretary must determine whether the benefits of the standard exceed its burdens by, to the greatest extent practicable, considering the seven statutory factors discussed previously. (42 U.S.C. 6316(a); 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. 6316(a); 42 U.S.C. 6295(o)(3)(B))

For this NOPR, DOE considered the impacts of amended standards for automatic commercial ice makers at each TSL, beginning with the max-tech 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, the tables in this section present a summary of the results of DOE's quantitative analysis for each TSL. In addition to the quantitative results presented in the tables, DOE also considers other burdens and benefits that affect economic justification. These include the impacts on identifiable subgroups of consumers who may be disproportionately affected by a national standard and impacts on employment.

1. Benefits and Burdens of TSLs Considered for Automatic Commercial Ice Maker Standards

Table V.56 and Table V.57 summarize the quantitative impacts estimated for each TSL for automatic commercial ice makers. The national impacts are measured over the lifetime of automatic commercial ice makers purchased in the 30-year period that begins in the anticipated year of compliance with amended standards (2027–2056). The energy savings, emissions reductions, and value of emissions reductions refer to FFC results. The efficiency levels contained in each TSL are described in section V.A of this document.

Table V.56 Summary of Analytical Results for Automatic Commercial Ice Maker TSLs: National Impacts

Category	TSL 1	TSL 2	TSL 3	TSL 4
Cumulative FFC National Energy Savings				
Quads	0.06	0.12	0.16	0.28
Cumulative FFC Emissions Reduction				
CO_2 (*million metric tons*)	2	4	5	9
CH_4 (*thousand tons*)	15	28	36	63
N_2O (*thousand tons*)	0.02	0.04	0.06	0.10
NO_X (*thousand tons*)	3	6	8	14
SO_2 (*thousand tons*)	1	2	2	4
Hg (*tons*)	0.006	0.012	0.015	0.027
Present Value of Benefits and Costs (*3% discount rate, billion 2022$*)				
Consumer Operating Cost Savings	0.41	0.70	0.88	1.16
Climate Benefits*	0.10	0.18	0.24	0.42
Health Benefits**	0.23	0.43	0.56	0.98
Total Benefits†	0.73	1.32	1.68	2.56
Consumer Incremental Product Costs‡	0.15	0.24	0.51	3.84
Consumer Net Benefits	0.26	0.47	0.38	(2.67)
Total Net Benefits	0.58	1.08	1.17	(1.28)
Present Value of Benefits and Costs (*7% discount rate, billion 2022$*)				
Consumer Operating Cost Savings	0.19	0.33	0.42	0.55
Climate Benefits*	0.10	0.18	0.24	0.42
Health Benefits**	0.10	0.18	0.24	0.41
Total Benefits†	0.38	0.70	0.89	1.38
Consumer Incremental Product Costs‡	0.08	0.13	0.28	2.10
Consumer Net Benefits	0.11	0.20	0.14	(1.55)
Total Net Benefits	0.30	0.56	0.61	(0.71)

Note: This table presents the costs and benefits associated with automatic commercial ice makers shipped in 2027−2056. These results include benefits to consumers that accrue after 2057 from the equipment shipped in 2027−2056.

* Climate benefits are calculated using four different estimates of the SC-CO_2, SC-CH_4, and SC-N_2O. Together, these represent the global SC-GHG. For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3-percent discount rate are shown; however, DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates. To monetize the benefits of reducing GHG emissions, this analysis uses the interim estimates presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990* published in February 2021 by the IWG.

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

† Total and net benefits include consumer, climate, and health benefits. For presentation purposes, total and net benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate.

‡ Costs include incremental equipment costs.

Table V.57 Summary of Analytical Results for Automatic Commercial Ice Makers TSLs: Manufacturer and Consumer Impacts

Category	TSL 1*	TSL 2*	TSL 3*	TSL 4*
Manufacturer Impacts				
Industry NPV (*million 2022*$) (No-new-standards case INPV = 96.4)	90.8 to 91.5	88.5 to 89.8	82.5 to 84.9	53.4 to 71.8
Industry NPV *(% change)*	(5.8) to (5.1)	(8.2) to (6.8)	(14.4) to (12.0)	(44.6) to (25.5)

Category	TSL 1*	TSL 2*	TSL 3*	TSL 4*
Consumer Average LCC Savings (2022$)				
B-IMH-W (≥300 and <785)	$0	$0	$0	($308)
B-IMH-W (≥785 and <1,500)	$0	$0	$0	($249)
B-IMH-A (≥300 and <727)	$26	$29	$22	($316)
B-IMH-A (≥727 and <1,500)	$195	$301	$232	($31)
B-RC(NRC)-A (≥ 988 and <4,000)	$93	$93	$37	($215)
B-SC-A (Portable ACIM) (≤38)	$1	$1	$1	($4)
B-SC-A (Refrigerated Storage ACIM)	$1	$3	$3	($4)
B-SC-A (<=50)	$8	$8	$8	($474)
B-SC-A (>50 and <134)	$0	$0	$0	($470)
B-SC-A (≥ 200 and <4,000)	$43	$67	$21	($382)
C-IMH-W (>50 and <801)	$0	$0	$0	($1,188)
C-IMH-A (≥310 and <820)	$145	$147	$3	($947)
C-RC&RC-A (≥800 and <4,000)	$146	$254	$162	($1,045)
C-SC-A (>50 and <149)	$5	$5	$5	($1,118)
C-SC-A (≥149 and <700)	$11	$11	$2	($1,218)
Shipment-Weighted Average*	**$20**	**$28**	**$17**	**($215)**
Consumer Simple PBP (years)				
B-IMH-W (≥300 and <785)	0.0	0.0	0.0	24.7
B-IMH-W (≥785 and <1,500)	0.0	0.0	0.0	13.0
B-IMH-A (≥300 and <727)	3.4	4.1	4.5	14.3
B-IMH-A (≥727 and <1,500)	1.3	2.4	3.4	6.4
B-RC(NRC)-A (≥ 988 and <4,000)	3.2	3.2	5.2	8.8
B-SC-A (Portable ACIM) (≤38)	3.3	3.8	3.8	9.6
B-SC-A (Refrigerated Storage ACIM)	2.3	2.1	2.1	9.1
B-SC-A (<=50)	5.7	5.7	5.7	43.7
B-SC-A (>50 and <134)	0.0	0.0	0.0	31.2
B-SC-A (≥ 200 and <4,000)	3.5	4.4	6.0	15.7
C-IMH-W (>50 and <801)	0.0	0.0	0.0	22.0
C-IMH-A (≥310 and <820)	1.4	1.9	4.8	14.1
C-RC&RC-A (≥800 and <4,000)	2.3	2.5	4.2	12.7
C-SC-A (>50 and <149)	5.3	5.3	5.3	64.7
C-SC-A (≥149 and <700)	4.0	4.0	5.7	35.4
Shipment-Weighted Average*	**3.4**	**3.8**	**4.0**	**17.6**
Percent of Consumers that Experience a Net Cost				
B-IMH-W (≥300 and <785)	0%	0%	0%	49%
B-IMH-W (≥785 and <1,500)	0%	0%	0%	82%
B-IMH-A (≥300 and <727)	4%	6%	16%	66%
B-IMH-A (≥727 and <1,500)	0%	3%	18%	64%
B-RC(NRC)-A (≥ 988 and <4,000)	3%	3%	10%	51%
B-SC-A (Portable ACIM) (≤38)	8%	12%	12%	84%
B-SC-A (Refrigerated Storage ACIM)	0%	0%	0%	86%
B-SC-A (<=50)	11%	11%	11%	90%
B-SC-A (>50 and <134)	0%	0%	0%	79%
B-SC-A (≥ 200 and <4,000)	5%	15%	46%	95%
C-IMH-W (>50 and <801)	0%	0%	0%	91%
C-IMH-A (≥310 and <820)	0%	1%	37%	65%
C-RC&RC-A (≥800 and <4,000)	1%	3%	20%	66%
C-SC-A (>50 and <149)	29%	29%	29%	93%
C-SC-A (≥149 and <700)	8%	8%	42%	90%
Shipment-Weighted Average*	**7%**	**10%**	**13%**	**82%**

Parentheses indicate negative (-) values.
* Weighted by shares of each equipment class in total projected shipments in 2022.

DOE first considered TSL 4, which represents the max-tech efficiency levels. At this level, DOE expects that all equipment classes would require use of ECMs to power the pump (for batch models), condenser fans (for air-cooled models), and auger (for continuous models). Further, DOE expects that improved condensers (*e.g.*, microchannel) and/or larger condensers would be adopted for air-cooled models, potable water use would be reduced to 20 gal/100 lb ice for batch ice makers currently consuming more potable water, and that drain water heat exchangers would be used for batch models. TSL 4 would save an estimated 0.28 quads of energy, an amount DOE considers significant. Under TSL 4, the NPV of consumer benefit would be -$1.55 billion using a discount rate of 7 percent, and -$2.67 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 4 are 9 Mt of CO_2, 4 thousand tons of SO_2, 14 thousand tons of NO_X, 0.027 tons of Hg, 63 thousand tons of CH_4, and 0.10 thousand tons of N_2O. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC-GHG at a 3-percent discount rate) at TSL 4 is $0.42 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 4 is $0.41 billion using a 7-percent discount rate and $0.98 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 4 is -$0.71 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 4 is -$1.28 billion.

At TSL 4, the average LCC impact is a savings of -$215 for automatic commercial ice makers. The simple payback period is 17.6 years for automatic commercial ice makers. The fraction of consumers experiencing a net LCC cost is 82 percent for automatic commercial ice makers.

At TSL 4, the projected change in INPV ranges from a decrease of $43.0 million to a decrease of $24.6 million, which corresponds to decreases of 44.6 percent and 25.5 percent, respectively. DOE estimates that industry must invest $32.1 million to comply with standards set at TSL 4. In 2026, a year before the compliance year, DOE estimates that 14 percent of ACIM equipment shipments would meet the max-tech efficiencies required.

At max-tech levels, nearly all manufacturers would need to spend significant development time sourcing, qualifying, and testing high-efficiency motors to meet the efficiencies required across their ACIM equipment portfolio. TSL 4 would also necessitate more complex system redesigns of the condenser for air-cooled equipment classes (*i.e.*, implementing microchannel condensers and/or larger condensers). Updating product lines to incorporate microchannel condensers would likely necessitate new tooling and additional design effort as manufacturers would need to obtain samples from suppliers, build pilot units, and conduct iterative testing for each basic model requiring updates. Increasing the size of the condenser would likely require new tooling and fixtures and significant development time as larger condensers could require a bigger base and updated chassis design. It is unclear if most manufacturers would have the engineering capacity to complete the necessary redesigns within the 3-year compliance period. If manufacturers require more than 3 years to redesign all their covered ACIM equipment models, they will likely prioritize redesigns based on sales volume.

As a result, the Secretary tentatively concludes that, at TSL 4 for automatic commercial ice makers, the benefits of energy savings, emission reductions, and the estimated monetary value of the emissions reductions would be outweighed by the economic burden on many consumers and the impacts on manufacturers, including the large conversion costs and profit margin impacts that could result in a large reduction in INPV. A majority of automatic commercial ice makers consumers (82 percent) would experience a net cost and the average LCC savings would be negative. The potential reduction in INPV could be as high as 44.6 percent. Due to the limited amount of engineering resources each manufacturer has, it is unclear if most manufacturers would be able to redesign all of their automatic commercial ice maker equipment offerings in the 3-year compliance period. Consequently, the Secretary has tentatively concluded that TSL 4 is not economically justified.

DOE then considered TSL 3, which represents the maximum efficiency level for each equipment class that has a positive LCC savings. At this level, DOE expects that ACIM models would require use of improved-efficiency motors, in many cases ECMs. Further, DOE expects that improved condensers (*e.g.*, microchannel) or larger condensers would be adopted for air-cooled models and that potable water use would be reduced to 20 gal/100 lb ice for batch ice makers currently consuming more water. TSL 3 would save an estimated 0.16 quads of energy, an amount DOE considers significant. Under TSL 3, the NPV of consumer benefit would be \$0.14 billion using a discount rate of 7 percent, and \$0.38 billion using a discount rate of 3 percent.

The cumulative emissions reductions at TSL 3 are 5 Mt of CO_2, 2 thousand tons of SO_2, 8 thousand tons of NO_X, 0.015 tons of Hg, 36 thousand tons of CH_4, and 0.06 thousand tons of N_2O. The estimated monetary value of the climate benefits from reduced GHG emissions (associated with the average SC-GHG at a 3-percent discount rate) at TSL 3 is $0.24 billion. The estimated monetary value of the health benefits from reduced SO_2 and NO_X emissions at TSL 3 is $0.24 billion using a 7-percent discount rate and $0.56 billion using a 3-percent discount rate.

Using a 7-percent discount rate for consumer benefits and costs, health benefits from reduced SO_2 and NO_X emissions, and the 3-percent discount rate case for climate benefits from reduced GHG emissions, the estimated total NPV at TSL 3 is $0.61 billion. Using a 3-percent discount rate for all benefits and costs, the estimated total NPV at TSL 3 is $1.17 billion.

At TSL 3, the average LCC impact is a savings of $17 for automatic commercial ice makers. The simple payback period is 4.0 years. The fraction of consumers experiencing a net LCC cost is 13 percent for automatic commercial ice makers.

At TSL 3, the projected change in INPV ranges from a decrease of $13.9 million to a decrease of $11.5 million, which corresponds to decreases of 14.4 percent and 12.0 percent, respectively. DOE estimates that industry must invest $15.9 million to comply with standards set at TSL 3. In 2026, a year before the compliance year, DOE estimates that approximately 37 percent of ACIM equipment shipments would meet the efficiency levels analyzed at TSL 3.

After considering the analysis and weighing the benefits and burdens, the Secretary has tentatively concluded that a standard set at TSL 3 for consumer automatic commercial ice makers would be economically justified. At this TSL, the average LCC savings for both batch automatic commercial ice makers and continuous automatic commercial ice makers consumers is positive. An estimated 13 percent of ACIM consumers experience a net cost. The FFC national energy savings are significant and the NPV of consumer benefits is positive using both a 3-percent and 7-percent discount rate. Notably, the benefits to consumers vastly outweigh the cost to manufacturers. At TSL 3, the NPV of consumer benefits, even measured at the more conservative discount rate of 7 percent, is over 13 times higher than the maximum estimated manufacturers' loss in INPV. The standard levels at TSL 3 are economically justified even without weighing the estimated monetary value of emissions reductions. When those emissions reductions are included—representing $0.24 billion in climate benefits (associated with the average SC-GHG at a 3-percent discount rate), and $0.56 billion (using a 3-percent discount rate) or $0.24 billion (using a 7-percent discount rate) in health benefits—the rationale becomes stronger still.

Therefore, based on the previous considerations, DOE proposes to adopt the energy conservation standards for automatic commercial ice makers at TSL 3. The proposed amended energy conservation standards for automatic commercial ice makers, which are expressed as kWh/100 lb ice, are shown in Table V.58 and Table V.59.

Table V.58 Proposed Amended Energy Conservation Standards for Batch Automatic Commercial Ice Makers

Equipment Type	Type of Cooling	Harvest Rate *lb ice/24 hours*	Maximum Energy Use* *kWh/100 lb ice*	Maximum Condenser Water Use** *gal/100 lb ice*
Ice-Making Head	Water	>50 and <300	6.49-0.0055H	200-0.022H
Ice-Making Head	Water	≥300 and <785	5.41-0.00191H	200-0.022H
Ice-Making Head	Water	≥785 and <1,500	4.13-0.00028H	200-0.022H
Ice-Making Head	Water	≥1,500 and <2,500	4	200-0.022H
Ice-Making Head	Water	≥2,500 and <4,000	4	145
Ice-Making Head	Air	>50 and <300	9.4 -0.01233H	NA
Ice-Making Head	Air	≥300 and <727	6.45-0.0025H	NA
Ice-Making Head	Air	≥727 and <1,500	5.09-0.00063H	NA
Ice-Making Head	Air	≥1500 and <4,000	4.23	NA
Remote Condensing (but Not Remote Compressor)	Air	>50 and <988	7.83-0.00342H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥988 and <4,000	4.45	NA

<table>
<tr><th>Equipment Type</th><th>Type of Cooling</th><th colspan="3">Harvest Rate
lb ice/24 hours</th><th>Maximum Energy Use*
kWh/100 lb ice</th><th>Maximum Condenser Water Use**
gal/100 lb ice</th></tr>
<tr><td>Remote Condensing and Remote Compressor</td><td>Air</td><td colspan="3">>50 and <930</td><td>7.82-0.00342H</td><td>NA</td></tr>
<tr><td>Remote Condensing and Remote Compressor</td><td>Air</td><td colspan="3">≥930 and <4,000</td><td>4.64</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Water</td><td colspan="3">>50 and <200</td><td>8.18-0.019H</td><td>191-0.0315H</td></tr>
<tr><td>Self-Contained</td><td>Water</td><td colspan="3">≥200 and <2,500</td><td>4.38</td><td>191-0.0315H</td></tr>
<tr><td>Self-Contained</td><td>Water</td><td colspan="3">≥2,500 and <4,000</td><td>4.38</td><td>112</td></tr>
<tr><td rowspan="4">Self-Contained</td><td rowspan="4">Air</td><td rowspan="4">≤50</td><td rowspan="2">Portable</td><td>≤38</td><td>19.43-0.27613H</td><td>NA</td></tr>
<tr><td>>38 and ≤50</td><td>8.94</td><td>NA</td></tr>
<tr><td colspan="2">Refrigerated Storage</td><td>29.8-0.37063H</td><td>NA</td></tr>
<tr><td colspan="2">Not Portable or Refrigerated Storage</td><td>21.08-0.19634H</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Air</td><td colspan="3">>50 and <134</td><td>13.61-0.0469H</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Air</td><td colspan="3">≥134 and <200</td><td>10.72-0.02533H</td><td>NA</td></tr>
<tr><td>Self-Contained</td><td>Air</td><td colspan="3">≥200 and <4,000</td><td>5.65</td><td>NA</td></tr>
</table>

* H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate.
** Water use is for the condenser only and does not include potable water used to make ice.

Table V.59 Proposed Amended Energy Conservation Standards for Continuous Automatic Commercial Ice Makers

Equipment Type	Type of Cooling	Harvest Rate *lb ice/24 hours*		Maximum Energy Use* *kWh/100 lb ice*	Maximum Condenser Water Use** *gal/100 lb ice*
Ice-Making Head	Water	>50 and <801		6.24-0.00267H	180-0.0198H
Ice-Making Head	Water	≥801 and <1,500		4.1	180-0.0198H
Ice-Making Head	Water	≥1,500 and <2,500		4.34	180-0.0198H
Ice-Making Head	Water	≥2,500 and <4,000		4.34	130.5
Ice-Making Head	Air	>50 and <310		7.49-0.00629H	NA
Ice-Making Head	Air	≥310 and <820		6.53-0.0032H	NA
Ice-Making Head	Air	≥820 and <1,500		3.91	NA
Ice-Making Head	Air	≥1,500 and <4,000		4.67	NA
Remote Condensing (but Not Remote Compressor)	Air	>50 and <800		9.24-0.0058H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥800 and <4,000		4.6	NA
Remote Condensing and Remote Compressor	Air	>50 and <800		9.42-0.0058H	NA
Remote Condensing and Remote Compressor	Air	≥800 and <4,000		4.78	NA
Self-Contained	Water	>50 and <900		6.5-0.00302H	153-0.0252H
Self-Contained	Water	≥900 and <2,500		3.78	153-0.0252H
Self-Contained	Water	≥2,500 and <4,000		3.78	90
Self-Contained	Air	≤50	Portable	22.99-0.27789H	NA
			Not Portable	24.51-0.29623H	
Self-Contained	Air	>50 and <149		11.2-0.03H	NA
Self-Contained	Air	≥149 and <700		7.66-0.00624H	NA
Self-Contained	Air	≥700 and <4,000		3.29	NA

* H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate.
** Water use is for the condenser only and does not include potable water used to make ice.

2. Annualized Benefits and Costs of the Proposed Standards

The benefits and costs of the proposed standards can also be expressed in terms of annualized values. The annualized net benefit is (1) the annualized national economic value (expressed in 2022$) of the benefits from operating equipment that meet the proposed standards (consisting primarily of operating cost savings from using less energy, minus increases in equipment purchase costs), and (2) the annualized monetary value of the climate and health benefits from emission reductions.

Table V.60 shows the annualized values for automatic commercial ice makers under TSL 3, expressed in 2022$. The results under the primary estimate are as follows.

Using a 7-percent discount rate for consumer benefits and costs and NO_X and SO_2 reduction benefits, and a 3-percent discount rate case for GHG social costs, the estimated cost of the proposed standards for automatic commercial ice makers is $29 million per year in increased equipment costs, while the estimated annual benefits are $44 million from reduced equipment operating costs, $14 million from GHG reductions, and $25 million from reduced NO_X and SO_2 emissions. In this case, the net benefit amounts to $53 million per year.

Using a 3-percent discount rate for all benefits and costs, the estimated cost of the proposed standards for automatic commercial ice makers is $29 million per year in increased equipment costs, while the estimated annual benefits are $51 million in reduced operating costs, $14 million from GHG reductions, and $32 million from reduced NO_X and SO_2 emissions. In this case, the net benefit amounts to $67 million per year.

Table V.60 Annualized Benefits and Costs of Proposed Energy Conservation Standards for Automatic Commercial Ice Makers (TSL 3)

	Million 2022$/year		
	Primary Estimate	**Low-Net-Benefits Estimate**	**High-Net-Benefits Estimate**
	3% discount rate		
Consumer Operating Cost Savings	51	50	52
Climate Benefits*	14	14	14
Health Benefits**	32	32	33
Total Benefits†	96	96	98
Consumer Incremental Product Costs‡	29	31	29
Net Benefits	67	64	70
	7% discount rate		
Consumer Operating Cost Savings	44	43	45
Climate Benefits*	14	14	14
Health Benefits**	25	25	26
Total Benefits†	83	82	84
Consumer Incremental Product Costs‡	29	31	29
Net Benefits	53	51	55

Note: This table presents the costs and benefits associated with automatic commercial ice makers shipped in 2027−2056. These results include benefits to consumers that accrue after 2056 from the equipment shipped in 2027−2056. The Primary, Low Net Benefits, and High Net Benefits Estimates utilize projections of energy prices from the *AEO2022* Reference case, Low Economic Growth case, and High Economic Growth case, respectively. In addition, incremental equipment costs reflect a medium decline rate in the Primary Estimate, a low decline rate in the Low Net Benefits Estimate, and a high decline rate in the High Net Benefits Estimate. The methods used to derive projected price trends are explained in sections IV.F.1 and IV.H.3 of this document. Note that the Benefits and Costs may not sum to the Net Benefits due to rounding.

* Climate benefits are calculated using four different estimates of the global SC-GHG (*see* section IV.L of this notice). For presentational purposes of this table, the climate benefits associated with the average SC-GHG at a 3-percent discount rate are shown; however, DOE emphasizes the importance and value of considering the benefits calculated using all four sets of SC-GHG estimates. To monetize the benefits of reducing GHG emissions, this analysis uses the interim estimates presented in the *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990* published in February 2021 by the IWG.

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

† Total benefits for both the 3-percent and 7-percent cases are presented using the average SC-GHG with 3-percent discount rate.

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

D. Reporting, Certification, and Sampling Plan

Manufacturers, including importers, must use product-specific certification templates to certify compliance to DOE. For automatic commercial ice makers, the certification template reflects the general certification requirements specified at 10 CFR 429.12 and the product-specific requirements specified at 10 CFR 429.45. As discussed in section VI.C of this document, DOE is not proposing to amend the product-specific certification requirements for this equipment.

VI. Procedural Issues and Regulatory Review

A. Review Under Executive Orders 12866, 13563, and 14904

Executive Order ("E.O.")12866, "Regulatory Planning and Review," as supplemented and reaffirmed by E.O. 13563, "Improving Regulation and Regulatory Review," 76 FR 3821 (Jan. 21, 2011) and E.O. 14094, "Modernizing Regulatory Review," 88 FR 21879 (April 11, 2023), requires agencies, to the extent permitted by law, to (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs ("OIRA") in the Office of Management and Budget ("OMB") has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in the preamble, this proposed regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit "significant regulatory actions" to OIRA for review. OIRA has determined that this proposed regulatory action does not constitute a "significant regulatory action" under section 3(f) of E.O. 12866. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis (IRFA) for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by E.O. 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (Aug. 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website (*www.energy.gov/gc/office-general-counsel*). DOE has prepared the following IRFA for the products that are the subject of this rulemaking.

For manufacturers of automatic commercial ice makers, the SBA has set a size threshold, which defines those entities classified as "small businesses" for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. (*See* 13 CFR part 121.)

The size standards are listed by NAICS code and industry description and are available at *www.sba.gov/document/support-table-size-standards*. Manufacturing of automatic commercial ice makers is classified under NAICS 333415, "Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing." The SBA sets a threshold of 1,250 employees or fewer for an entity to be considered as a small business for this category.

1. Description of Reasons Why Action Is Being Considered

DOE is proposing new and amended energy conservation standards for automatic commercial ice makers. EPCA prescribed initial standards for this equipment. (42 U.S.C. 6313(d)(1)) EPCA also authorizes DOE to establish new standards for automatic commercial ice makers not covered by the statutory standards. (42 U.S.C. 6313(d)(2)) Not later than January 1, 2015, with respect to the standards established under 42 U.S.C. 6313(d)(1), and, with respect to the standards established under 42 U.S.C. 6313(d)(2), not later than 5 years after the date on which the standards take effect, EPCA required DOE to issue a final rule to determine whether amending the applicable standards is technologically feasible and economically justified. (42 U.S.C. 6313(d)(3)(A)) Not later than 5 years after the effective date of any amended standards under 42 U.S.C. 6313(d)(3)(A) or the publication of a final rule determining that amending the standards is not technologically feasible or economically justified, DOE must issue a final rule to determine whether amending the standards established under 42 U.S.C. 6313(d)(1) or the amended standards, as applicable, is technologically feasible or economically justified. (42 U.S.C. 6313(d)(3)(B)) This proposed rulemaking is in accordance with DOE's obligations under EPCA.

2. Objectives of, and Legal Basis for, Rule

EPCA authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. Title III, Part C of EPCA, added by Pub. L. 95-619, Title IV, section 441(a) (42 U.S.C. 6311–6317, as codified), established the Energy Conservation Program for Certain Industrial Equipment, which sets forth a variety of provisions designed to improve energy efficiency. This equipment includes automatic commercial ice makers, the subject of this document. (42 U.S.C. 6311(1)(F)) Not later than 5 years after the effective date of any amended standards under 42 U.S.C. 6313(d)(3)(A) or the publication of a final rule determining that amending the standards is not technologically feasible or economically justified, DOE must issue a final rule to determine whether amending the standards established under 42 U.S.C. 6313(d)(1) or the amended standards, as applicable, is technologically feasible or economically justified. (42 U.S.C. 6313(d)(3)(B)) A final rule issued under 42 U.S.C. 6313(d)(2) or (3) must establish standards at the maximum level that is technologically feasible and economically justified, as provided in 42 U.S.C. 6295(o) and (p).

3. Description on Estimated Number of Small Entities Regulated

DOE reviewed this proposed rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. 68 FR 7990. DOE conducted a market survey to identify potential small manufacturers of automatic commercial ice makers. DOE began its assessment by reviewing DOE's CCD,[84] California Energy Commission's MAEDbS,[85] EPA's ENERGY STAR Product

[84] U.S. Department of Energy's Compliance Certification Database is available at *www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A** (last accessed November 28, 2022).
[85] California Energy Commission's Modernized Appliance Efficiency Database System is available at *cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx* (last accessed November 28, 2022).

Finder dataset,[86] AHRI's Directory of Certified Product Performance,[87] individual company websites, and prior automatic commercial ice maker rulemakings to identify manufacturers of the covered equipment. To identify low-capacity automatic commercial ice makers, DOE expanded on the database used for the March 2022 Preliminary Analysis with publicly available data aggregated from web scraping retail websites. DOE then consulted publicly available data, such as manufacturer websites, manufacturer specifications and product literature, import/export logs (*e.g.*, bills of lading from Panjiva),[88] and basic model numbers, to identify original equipment manufacturers (OEMs) of automatic commercial ice makers. DOE further relied on public data and subscription-based market research tools (*e.g.*, Dun & Bradstreet reports)[89] to determine company, location, headcount, and annual revenue. DOE also asked industry representatives if they were aware of any small manufacturers during manufacturer interviews. DOE screened out companies that do not offer equipment covered by this rulemaking, do not meet the SBA's definition of a "small business," or are foreign-owned and operated.

DOE initially identified twenty-three OEMs that sell automatic commercial ice makers in the United States. Of the twenty-three OEMs identified, DOE tentatively determined that only one company qualifies as a small business and is not foreign-owned and operated.

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[86] U.S. Environmental Protection Agency's ENERGY STAR Product Finder dataset is available at *www.energystar.gov/productfinder/* (last accessed November 17, 2022).
[87] AHRI Directory of Certified Product Performance *www.ahridirectory.org/Search/SearchHome?ReturnUrl=%2f* (last accessed November 28, 2022).
[88] S&P Global. Panjiva Market Intelligence is available at *panjiva.com/import-export/United-States* (last accessed January 20, 2023).
[89] Dun &Bradstreet Hoovers subscription login is accessible at: *app.dnbhoovers.com/* (last accessed January 20, 2023).

4. Description and Estimate of Compliance Requirements Including Differences in Cost, if Any, for Different Groups of Small Entities

The small automatic commercial ice maker manufacturer does not currently certify any models of the covered equipment in DOE's CCD. DOE identified this small business through its review of the California Energy Commission's MAEDbS and EPA's ENERGY STAR dataset. The one small business has seven unique basic models in the MAEDbS and ENERGY STAR product databases. Of those seven models, six are C-RC&RC-A (≥800 and <4,000) and the remaining model is a C-IMH-A (≥310 and <820). All seven models meet the efficiency levels required by the proposed standard. Therefore, DOE does not expect that this manufacturer would incur notable conversion costs as a direct result of the proposed standards outlined in this NOPR.

DOE seeks comments, information, and data on the number of small businesses in the industry, the names of those small businesses, and their market shares by equipment class. DOE also requests comment on the potential impacts of the proposed standards on small manufacturers.

5. 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 proposed rule.

6. Significant Alternatives to the Rule

The discussion in the previous section analyzes impacts on small businesses that would result from the energy conservation standards in DOE's proposed rule as represented by TSL 3. In reviewing alternatives to the proposed rule, DOE examined energy conservation standards set at lower efficiency levels. Although TSL 1 and TSL 2 would reduce the impacts on small business manufacturers, those levels would come at the expense of a reduction in energy savings. TSL 1 achieves 63-percent-lower energy savings compared to the energy savings at TSL 3. TSL 2 achieves 25-percent-lower energy savings compared to the energy savings at TSL 3.

Based on the presented discussion, amending and establishing standards at TSL 3 balances the benefits of the energy savings at TSL 3 with the potential burdens placed on ACIM equipment manufacturers, including small business manufacturers. Accordingly, DOE does not propose one of the other TSLs considered in the analysis, or the other policy alternatives examined as part of the regulatory impact analysis and included in chapter 17 of the NOPR TSD.

Manufacturers subject to DOE's energy efficiency standards may apply to DOE's Office of Hearings and Appeals for exception relief under certain circumstances. Manufacturers should refer to 10 CFR part 1003 for additional details.

C. Review Under the Paperwork Reduction Act

Under the procedures established by the Paperwork Reduction Act of 1995 (PRA), a person is not required to respond to a collection of information by a Federal agency unless that collection of information displays a currently valid OMB Control Number.

OMB Control Number 1910-1400, Compliance Statement Energy/Water Conservation Standards for Appliances, is currently valid and assigned to the certification reporting requirements applicable to covered equipment, including automatic commercial ice makers.

DOE's certification and compliance activities ensure accurate and comprehensive information about the energy and water use characteristics of covered products and covered equipment sold in the United States. Manufacturers of all covered products and covered equipment must submit a certification report before a basic model is distributed in commerce, annually thereafter, and if the basic model is redesigned in such a manner to increase the consumption or decrease the efficiency of the basic model such that the certified rating is no longer supported by the test data. Additionally, manufacturers must report when production of a basic model has ceased and is no longer offered for sale as part of the next annual certification report following such cessation. DOE requires the manufacturer of any covered product or covered equipment to establish, maintain, and retain the records of certification reports, of the underlying test data for all certification testing, and of any other testing conducted to satisfy the requirements of part 429, part 430, and/or part 431. Certification reports provide DOE and consumers with comprehensive, up-to date efficiency information and support effective enforcement.

New certification data would be required for low-capacity automatic commercial ice makers were this NOPR to be finalized as proposed. However, DOE is not proposing new or amended certification or reporting requirements for automatic commercial ice makers in this NOPR. Instead, DOE may consider proposals to establish certification requirements and reporting for automatic commercial ice makers under a separate rulemaking regarding appliance and equipment certification. DOE will address changes to OMB Control Number 1910-1400 at that time, as necessary.

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

D. Review Under the National Environmental Policy Act of 1969

DOE is analyzing this proposed regulation in accordance with the National Environmental Policy Act of 1969 (NEPA) and DOE's NEPA implementing regulations (10 CFR part 1021). DOE's regulations include a categorical exclusion for rulemakings that establish energy conservation standards for consumer products or industrial equipment. 10 CFR part 1021, subpart D, appendix B5.1. DOE anticipates that this rulemaking qualifies for categorical exclusion B5.1 because it is a rulemaking that establishes energy conservation standards for consumer products or industrial equipment, none of the exceptions identified in categorical exclusion B5.1(b) apply, no extraordinary circumstances exist that require further environmental analysis, and it otherwise meets the requirements for application of a categorical exclusion. *See* 10 CFR 1021.410. DOE will complete its NEPA review before issuing the final rule.

E. Review Under Executive Order 13132

E.O. 13132, "Federalism," 64 FR 43255 (Aug. 10, 1999), imposes certain requirements on Federal agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed rule and has tentatively determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the equipment that is 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. (*See* 42 U.S.C. 6316(a) and (b); 42 U.S.C. 6297) Therefore, no further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

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

G. Review Under the Unfunded Mandates Reform Act of 1995

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

This rule does not contain a Federal intergovernmental mandate, nor is it expected to require expenditures of $100 million or more in any one year by the private sector. As a result, the analytical requirements of UMRA do not apply.

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 proposed rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Executive Order 12630

Pursuant to E.O. 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights," 53 FR 8859 (Mar.15, 1988), DOE has determined that this proposed rule would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

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

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for Federal agencies to review most disseminations of information to the public under information quality guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct.7, 2002). Pursuant to OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at *www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf*. DOE has reviewed this NOPR under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

K. Review Under Executive Order 13211

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

DOE has tentatively concluded that this regulatory action, which proposes new and amended energy conservation standards for automatic commercial ice makers, is not a significant energy action because the proposed standards are not likely to have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as such by the Administrator at OIRA. Accordingly, DOE has not prepared a Statement of Energy Effects on this proposed rule.

L. Information Quality

On December 16, 2004, OMB, in consultation with the Office of Science and Technology Policy (OSTP), issued its Final Information Quality Bulletin for Peer Review (the Bulletin). 70 FR 2664 (Jan. 14, 2005). The Bulletin establishes that certain scientific information shall be peer reviewed by qualified specialists before it is disseminated by the Federal government, including influential scientific information related to agency regulatory actions. The purpose of the Bulletin is to enhance the quality and credibility of the government's scientific information. Under the Bulletin, the energy conservation standards rulemaking analyses are "influential scientific information," which the Bulletin defines as "scientific information the agency reasonably can determine will have, or does have, a clear and substantial impact on important public policies or private sector decisions." 70 FR 2664, 2667.

In response to OMB's Bulletin, DOE conducted formal peer reviews of the energy conservation standards development process and the analyses that are typically used and prepared a report describing that peer review.[90] 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. Because available data, models, and technological understanding have changed since 2007, DOE has engaged with the National Academy of Sciences to review DOE's analytical methodologies to ascertain whether modifications are needed to improve the Department's analyses. DOE is in the process of evaluating the resulting report.[91]

[90] The 2007 "Energy Conservation Standards Rulemaking Peer Review Report" is available at www.*energy.gov/eere/buildings/downloads/energy-conservation-standards-rulemaking-peer-review-report-0* (last accessed January 25, 2023).
[91] The report is available at *www.nationalacademies.org/our-work/review-of-methods-for-setting-building-and-equipment-performance-standards*.

VII. Public Participation

A. Participation in the Webinar

The time and date of the webinar meeting is listed in the **DATES** section at the beginning of this document. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *www.energy.gov/eere/buildings/public-meetings-and-comment-deadlines*. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Procedure for Submitting Prepared General Statements for Distribution

Any person who has an interest in the topics addressed in this NOPR, or who is representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the webinar. Such persons may submit to *ApplianceStandardsQuestions@ee.doe.gov*. Persons who wish to speak should include with their request a computer file in WordPerfect, Microsoft Word, PDF, or text (ASCII) file format that briefly describes the nature of their interest in this rulemaking and the topics they wish to discuss. Such persons should also provide a daytime telephone number where they can be reached.

1. Conduct of the Webinar

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

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

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

A transcript of the webinar 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.

C. Submission of Comments

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

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

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

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

DOE processes submissions made through *www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *www.regulations.gov* provides after you have successfully uploaded your comment.

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

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

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

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email two well-marked copies: one copy of the document marked "confidential" including all the information believed to be confidential, and one copy of the document marked "non-confidential" with the information believed to be confidential deleted. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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

D. Issues on Which DOE Seeks Comment

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

(1) DOE requests comments on its proposal to require that the proposed standards, if adopted, would apply to all automatic commercial ice makers

listed in Table I.1 and Table I.2 manufactured in, or imported into, the United States on or after the date that is 3 years after the date on which the final amended standard is published. More generally, DOE requests comment on whether it would be beneficial to ACIM equipment manufacturers to align the compliance date of any DOE amended or established standards as closely as possible with the refrigerant prohibition dates proposed by the December 2022 EPA NOPR.

(2) DOE requests comments on its proposal to establish equipment classes and energy conservation standards for low-capacity ACIM categories.

(3) DOE requests comments on its proposal to amend the definition of refrigerated storage automatic commercial ice maker.

(4) DOE requests comments on its proposal to use baseline levels for automatic commercial ice makers based upon the design changes made by manufacturers in response to the December 2022 EPA NOPR.

(5) DOE seeks comment on the method for estimating manufacturing production costs.

(6) DOE requests comments on its approach to monetizing the impact of the rebound effect.

(7) DOE requests comments on how to address the climate benefits and other non-monetized effects of the proposal.

(8) DOE seeks comments, information, and data on the capital conversion costs and product conversion costs estimated for each TSL.

(9) DOE seeks comment on whether manufacturers expect that manufacturing capacity constraints or engineering resource constraints would limit equipment availability to consumers in the timeframe of the new or amended standard compliance date (2027).

(10) DOE requests comments on the magnitude of costs associated with transitioning ACIM equipment models and production facilities to accommodate low-GWP refrigerants, such as R-290, that would be incurred between the publication of this NOPR and the proposed compliance date of new and amended standards. Quantification and categorization of these costs, such as engineering efforts, testing lab time, certification costs, and capital investments (*e.g.*, new charging equipment), would enable DOE to refine its analysis.

(11) DOE requests information regarding the impact of cumulative regulatory burden on manufacturers of automatic commercial ice makers associated with multiple DOE standards or equipment-specific regulatory actions of other Federal agencies.

(12) DOE seeks comments, information, and data on the number of small businesses in the industry, the names of those small businesses, and their market shares by equipment class. DOE also requests comment on the potential impacts of the proposed standards on small manufacturers.

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

VIII. Approval of the Office of the Secretary

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

List of Subjects in 10 CFR Part 431

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

Signing Authority

This document of the Department of Energy was signed on April 28, 2023, by Francisco Alejandro Moreno, Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on May 2, 2023.

Treena V. Garrett
Federal Register Liaison Officer,
U.S. Department of Energy

For the reasons set forth in the preamble, DOE proposes to amend part 431 of chapter II, subchapter D, of title 10 of the Code of Federal Regulations, as set forth below:

PART 431 - ENERGY EFFICIENCY PROGRAM FOR CERTAIN COMMERICAL AND INDUSTRIAL EQUIPMENT

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

Authority: 42 U.S.C. 6291–6317; 28 U.S.C. 2461 note.

2. Amend § 431.132 by revising the definition of "Refrigerated storage automatic commercial ice maker" to read as follows:

§431.132 Definitions concerning automatic commercial ice makers.

* * * * *

Refrigerated storage automatic commercial ice maker means an automatic commercial ice maker that has a refrigeration system that actively refrigerates the self-contained ice storage bin and for which there is no internal storage space other than the ice storage bin that holds the produced ice.

* * * * *

3. Revise § 431.136 to read as follows:

§431.136 Energy conservation standards and their effective dates.

(a) All basic models of automatic commercial ice makers must be tested for performance using the applicable DOE test procedure in §431.134, be compliant with the applicable standards set forth in paragraphs (b) through (c) of this section, and be certified to the Department of Energy under 10 CFR part 429 of this chapter.

(b) Each batch type automatic commercial ice maker with capacities between 50 and 4,000 pounds per 24-hour period manufactured on or after January 28, 2018 and before [*date 3 Years after date of publication of the final rule in the federal register*], shall meet the following standard levels:

Equipment type	**Type of cooling**	**Harvest rate lb ice/24 hours**	**Maximum energy use kilowatt-hours (kWh)/100 lb ice[1]**	**Maximum condenser water use gal/100 lb ice[2]**
Ice-Making Head	Water	< 300	6.88-0.0055H	200-0.022H.
Ice-Making Head	Water	≥300 and <850	5.80-0.00191H	200-0.022H.
Ice-Making Head	Water	≥850 and <1,500	4.42-0.00028H	200-0.022H.
Ice-Making Head	Water	≥1,500 and <2,500	4.0	200-0.022H.
Ice-Making Head	Water	≥2,500 and <4,000	4.0	145.
Ice-Making Head	Air	< 300	10-0.01233H	NA.
Ice-Making Head	Air	≥ 300 and < 800	7.05-0.0025H	NA.
Ice-Making Head	Air	≥ 800 and < 1,500	5.55-0.00063H	NA.
Ice-Making Head	Air	≥ 1500 and < 4,000	4.61	NA.
Remote Condensing (but not remote compressor)	Air	< 988	7.97-0.00342H	NA.
Remote Condensing (but not remote compressor)	Air	≥ 988 and < 4,000	4.59	NA.
Remote Condensing and Remote Compressor	Air	< 930	7.97-0.00342H	NA.
Remote Condensing and Remote Compressor	Air	≥ 930 and < 4,000	4.79	NA.
Self-Contained	Water	< 200	9.5-0.019H	191-0.0315H.
Self-Contained	Water	≥ 200 and < 2,500	5.7	191-0.0315H.
Self-Contained	Water	≥ 2,500 and < 4,000	5.7	112.
Self-Contained	Air	< 110	14.79-0.0469H	NA.
Self-Contained	Air	≥ 110 and < 200	12.42-0.02533H	NA.
Self-Contained	Air	≥ 200 and < 4,000	7.35	NA.

[1] H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate. Source: 42 U.S.C. 6313(d).

[2] Water use is for the condenser only and does not include potable water used to make ice.

(c) Each continuous type automatic commercial ice maker with capacities between 50 and 4,000 pounds per 24-hour period manufactured on or after January 28, 2018 and before [*date 3 Years after date of publication of the final rule in the federal register*], shall meet the following standard levels:

Equipment type	**Type of cooling**	**Harvest rate lb ice/24 hours**	**Maximum energy use kWh/100 lb ice**[1]	**Maximum condenser water use gal/100 lb ice**[2]
Ice-Making Head	Water	<801	6.48-0.00267H	180-0.0198H.
Ice-Making Head	Water	≥801 and <2,500	4.34	180-0.0198H.
Ice-Making Head	Water	≥2,500 and <4,000	4.34	130.5.
Ice-Making Head	Air	<310	9.19-0.00629H	NA.
Ice-Making Head	Air	≥310 and <820	8.23-0.0032H	NA.
Ice-Making Head	Air	≥820 and <4,000	5.61	NA.
Remote Condensing (but not remote compressor)	Air	<800	9.7-0.0058H	NA.
Remote Condensing (but not remote compressor)	Air	≥800 and <4,000	5.06	NA.
Remote Condensing and Remote Compressor	Air	<800	9.9-0.0058H	NA.
		≥800 and <4,000	5.26	NA.
Self-Contained	Water	<900	7.6-0.00302H	153-0.0252H.
Self-Contained	Water	≥900 and <2,500	4.88	153-0.0252H.
Self-Contained	Water	≥2,500 and <4,000	4.88	90.
Self-Contained	Air	<200	14.22-0.03H	NA.
Self-Contained	Air	≥200 and <700	9.47-0.00624H	NA.
Self-Contained	Air	≥700 and <4,000	5.1	NA.

[1] H = harvest rate in pounds per 24 hours, indicating the water or energy use for a given harvest rate. Source: 42 U.S.C. 6313(d).

[2] Water use is for the condenser only and does not include potable water used to make ice.

(d) Each batch type automatic commercial ice maker with capacities up to 4,000 lb/24 h manufactured in, or imported into, the United States on or after [*date 3 Years after date of publication of the final rule in the federal register*], shall meet the following standard levels:

Equipment Type	Type of Cooling	Harvest Rate *lb ice/24 hours*	Maximum Energy Use* *kWh/100 lb ice*	Maximum Condenser Water Use** *gal/100 lb ice*
Ice-Making Head	Water	>50 and <300	6.49-0.0055H	200-0.022H
Ice-Making Head	Water	≥300 and <785	5.41-0.00191H	200-0.022H
Ice-Making Head	Water	≥785 and <1,500	4.13-0.00028H	200-0.022H
Ice-Making Head	Water	≥1,500 and <2,500	4	200-0.022H
Ice-Making Head	Water	≥2,500 and <4,000	4	145
Ice-Making Head	Air	>50 and <300	9.4 -0.01233H	NA
Ice-Making Head	Air	≥300 and <727	6.45-0.0025H	NA
Ice-Making Head	Air	≥727 and <1,500	5.09-0.00063H	NA
Ice-Making Head	Air	≥1500 and <4,000	4.23	NA
Remote Condensing (but Not Remote Compressor)	Air	>50 and <988	7.83-0.00342H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥988 and <4,000	4.45	NA
Remote Condensing and Remote Compressor	Air	>50 and <930	7.82-0.00342H	NA
Remote Condensing and Remote Compressor	Air	≥930 and <4,000	4.64	NA
Self-Contained	Water	>50 and <200	8.18-0.019H	191-0.0315H
Self-Contained	Water	≥200 and <2,500	4.38	191-0.0315H
Self-Contained	Water	≥2,500 and <4,000	4.38	112
Self-Contained	Air	≤50 — Portable — ≤38	19.43-0.27613H	NA
Self-Contained	Air	≤50 — Portable — >38 and ≤50	8.94	NA
Self-Contained	Air	≤50 — Refrigerated Storage	29.8-0.37063H	NA
Self-Contained	Air	≤50 — Not Portable or Refrigerated Storage	21.08-0.19634H	NA
Self-Contained	Air	>50 and <134	13.61-0.0469H	NA
Self-Contained	Air	≥134 and <200	10.72-0.02533H	NA
Self-Contained	Air	≥200 and <4,000	5.65	NA

* H = harvest rate in pounds per 24 hours, indicating the condenser water or energy use for a given harvest rate.
** Water use is for the condenser only and does not include potable water used to make ice.

(e) Each continuous type automatic commercial ice maker with capacities up to 4,000 lb/24 h manufactured in, or imported into, the United States on or after [*date 3 Years after date of publication of the final rule in the federal register*], shall meet the following standard levels:

Equipment Type	Type of Cooling	Harvest Rate *lb ice/24 hours*	Maximum Energy Use* *kWh/100 lb ice*	Maximum Condenser Water Use** *gal/100 lb ice*
Ice-Making Head	Water	>50 and <801	6.24-0.00267H	180-0.0198H
Ice-Making Head	Water	≥801 and <1,500	4.1	180-0.0198H
Ice-Making Head	Water	≥1,500 and <2,500	4.34	180-0.0198H
Ice-Making Head	Water	≥2,500 and <4,000	4.34	130.5
Ice-Making Head	Air	>50 and <310	7.49-0.00629H	NA
Ice-Making Head	Air	≥310 and <820	6.53-0.0032H	NA
Ice-Making Head	Air	≥820 and <1,500	3.91	NA
Ice-Making Head	Air	≥1,500 and <4,000	4.67	NA
Remote Condensing (but Not Remote Compressor)	Air	>50 and <800	9.24-0.0058H	NA
Remote Condensing (but Not Remote Compressor)	Air	≥800 and <4,000	4.6	NA
Remote Condensing and Remote Compressor	Air	>50 and <800	9.42-0.0058H	NA
Remote Condensing and Remote Compressor	Air	≥800 and <4,000	4.78	NA
Self-Contained	Water	>50 and <900	6.5-0.00302H	153-0.0252H
Self-Contained	Water	≥900 and <2,500	3.78	153-0.0252H
Self-Contained	Water	≥2,500 and <4,000	3.78	90
Self-Contained	Air	≤50 Portable	22.99-0.27789H	NA
		≤50 Not Portable	24.51-0.29623H	
Self-Contained	Air	>50 and <149	11.2-0.03H	NA
Self-Contained	Air	≥149 and <700	7.66-0.00624H	NA
Self-Contained	Air	≥700 and <4,000	3.29	NA

* H = harvest rate in pounds per 24 hours, indicating the condenser water or energy use for a given harvest rate.
** Water use is for the condenser only and does not include potable water used to make ice.

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