



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

October 5, 2023

Dear ENERGY STAR® Partners and Stakeholders:

The U.S. Environmental Protection Agency (EPA) is pleased to announce final recognition criteria for ENERGY STAR Most Efficient 2024. This letter outlines the final criteria.

These criteria will recognize the most efficient ENERGY STAR products in 2024 across 14 product categories: Air Source Heat Pumps, Ceiling Fans, Clothes Dryers, Clothes Washers, Computer Monitors, Consumer Refrigeration Products, Dehumidifiers, Dishwashers, Geothermal Heat Pumps, Residential Windows and Sliding Glass Doors, Residential Skylights and Tubular Daylighting Devices, Room Air Cleaners, Room Air Conditioners, and Ventilating Fans. Products that meet the 2024 criteria will deliver significant savings over a conventional product as noted below:

<p>Air Source Heat Pumps: 9-15% in annual energy savings over the Federal Minimum.</p>	<p>Ceiling Fans: Nearly 75% in annual energy savings over the Federal Minimum.</p>	<p>Clothes Dryers: 245-300 kWh/yr in annual energy savings, 40%-60% over the Federal Minimum for the most common product classes.</p>
<p>Clothes Washers: ≤ 2.5 cu-ft: 100 kWh/yr in annual energy savings, 25% over the Federal Minimum and 1,500 gal/year in annual water savings, 37% over the Federal Minimum. > 2.5 cu-ft: 450 kWh/yr in annual energy savings, more than 40% over the Federal Minimum and 3,500 gal/yr in annual water savings, 45% over the Federal Minimum.</p>	<p>Computer Monitors: 13.7 kWh/yr in annual energy savings, more than 30% savings over a standard model.</p>	<p>Consumer Refrigeration Products: Standard Refrigerators: 40-180 kWh/yr in annual energy savings, 10-30% over the Federal Minimum. Standard Freezers: 35-90 kWh/yr in annual energy savings, 15-20% over the Federal Minimum. Compact Refrigerators and Freezers: 35-100 kWh/yr in annual energy savings, 20-30% over the Federal Minimum.</p>

<p>Dehumidifiers: Portable Dehumidifiers: 100 and 170 kWh/yr in annual energy savings, 30% and over 20% above the Federal Minimum for the most common, smaller product classes.</p> <p>Whole-home Dehumidifiers: 400 kWh/yr in annual energy savings, over 20% above the Federal Minimum for the most common, smallest product class.</p>	<p>Dishwashers: 80 kWh/yr in annual energy savings, nearly 30% over the Federal Minimum. 400 gal/yr in annual water savings, 35% over the Federal Minimum.</p> <p>Residential Windows and Sliding Glass Doors: Savings vary by climate, house construction, and number and type of windows replaced.</p>	<p>Geothermal Heat Pumps: 1000-1600 kWh/yr in annual energy savings, 15-40% over the Federal Minimum.</p> <p>Room Air Cleaners: 75-515 kWh/yr, depending on size. Almost 70% to 75% annual energy savings over numerous state standards.</p>
<p>Room Air Conditioners: 100-600 kWh/yr in annual energy savings, 35-50% over Federal Minimum.</p>	<p>Ventilating Fans: Bathroom/utility: 20 kWh/yr in annual energy savings, 80% over a standard model. In-line: 5 kWh/yr in annual energy savings, 60% over a standard model.</p>	

**Note: In the case of most product types, energy use of a product that meets ENERGY STAR Most Efficient 2024 criteria is compared to the federal minimum.*

Overview of Comments on the ENERGY STAR Most Efficient 2024 Proposals

Stakeholders shared feedback with EPA through 16 sets of written comments from 26 commenters. Commenters offered support for the proposed recognition criteria, as well as a select set of proposed adjustments that EPA summarizes and responds to in the [comment response document](#).

Air Source Heat Pumps: EPA has lowered the EER2 requirement for ducted cold climate heat pumps to match that needed for Inflation Reduction Act tax credits. This is consistent with our efforts to make it easier for consumers and installers to identify tax-credit eligible equipment. In addition, it reflects that cold climate heat pumps sized for heating loads are unlikely to be at full capacity for peak cooling loads. Lastly, in many heating-dominated climates, peak cooling demand is not a critical factor. The criteria for other heat pump types are finalized as they were proposed.

Dehumidifiers: One stakeholder recommended EPA revise the level for the smallest product class for portable dehumidifiers from an IEF of 1.70 to 1.75. In revisiting the available data, EPA found that 40% of base models meet an IEF of 1.70. As such, EPA agrees with this commenter and is finalizing the criterion for the smallest product class at an IEF of 1.75. Five percent of models from 7 brands meet this level.

ENERGY STAR Most Efficient 2024 Categories and Recognition Criteria

Final criteria for ENERGY STAR Most Efficient 2024 are summarized below. In addition to meeting these performance requirements, products must be certified as ENERGY STAR by an EPA-recognized certification body. Additional detail for each product category is included in the recognition criteria documents available at www.energystar.gov/mostefficient.

Category	ENERGY STAR Most Efficient 2024 Recognition Criteria																	
Ceiling Fans	<p>Efficiency as per 10 CFR 430 Subpart B, Appendix U (cfm/W)</p> <table border="1"> <thead> <tr> <th>Ceiling Fan Type</th> <th>Ceiling Fan Efficiency (CFM/W)*</th> </tr> </thead> <tbody> <tr> <td>Standard and Low-Mount HSSD Ceiling Fans</td> <td>$\geq 3.25 \times \text{Blade Span} + 107$</td> </tr> <tr> <td>Hugger Fans</td> <td>$\geq 1.44 \times \text{Blade Span} + 120$</td> </tr> </tbody> </table> <p><i>*This is a weighted average efficiency in different modes, according to 10 CFR 430 Subpart B, Appendix U</i></p>	Ceiling Fan Type	Ceiling Fan Efficiency (CFM/W)*	Standard and Low-Mount HSSD Ceiling Fans	$\geq 3.25 \times \text{Blade Span} + 107$	Hugger Fans	$\geq 1.44 \times \text{Blade Span} + 120$											
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Clothes Dryers	<p>Products must meet the applicable energy performance requirements shown in the table below, as determined by 10 CFR Part 430 Subpart B Appendix D2, unless noted otherwise.</p> <table border="1"> <thead> <tr> <th>Cycle Setting</th> <th>Product Type</th> <th>CEFBASE (lbs/kWh)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Normal</td> <td>Compact Ventless Electric (240 V)</td> <td>≥ 5.5</td> </tr> <tr> <td>Compact Electric (120 V)</td> <td>≥ 6.3</td> </tr> <tr> <td>Electric (All Others)</td> <td>≥ 5.2</td> </tr> <tr> <td rowspan="3">Normal, Maximum Dryness¹</td> <td>Compact Ventless Electric (240 V)</td> <td>≥ 2.68</td> </tr> <tr> <td>Compact Electric (120 V)</td> <td>≥ 3.80</td> </tr> <tr> <td>Electric (All Others)</td> <td>≥ 3.93</td> </tr> </tbody> </table>	Cycle Setting	Product Type	CEFBASE (lbs/kWh)	Normal	Compact Ventless Electric (240 V)	≥ 5.5	Compact Electric (120 V)	≥ 6.3	Electric (All Others)	≥ 5.2	Normal, Maximum Dryness ¹	Compact Ventless Electric (240 V)	≥ 2.68	Compact Electric (120 V)	≥ 3.80	Electric (All Others)	≥ 3.93
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¹ For purposes of this requirement, the manufacturer shall test the dryer according to the provisions in the DOE test procedure in 10 CFR 430, Subpart B, Appendix D2, but where the drying temperature setting can be chosen independently of the program, it shall be set to the maximum. At the time of certification, for each basic model the manufacturer shall report per this criteria section the energy performance (CEF), the cycle program name, the temperature setting, the dryness setting, as well as any settings enabled by default, and the time taken to complete the energy test cycle (as defined in the Test Requirements Section of the current ENERGY STAR specification).

Clothes Washers*

Clothes Washer Capacity	Integrated Modified Energy Factor (IMEF)	Integrated Water Factor (IWF)
≤ 2.5 cu-ft	≥ 2.2	≤ 3.7
> 2.5 cu-ft	≥ 2.92	≤ 3.2

Total Cleaning Score (CS _t)	≥ 85.0
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To be recognized, laundry centers and combination all-in-one washer-dryers with air-only drying must meet both the Most Efficient washer and dryer criteria. Combination all-in-one washer-dryers with air-only drying do not need to meet the time requirement for ENERGY STAR clothes dryers.

Computer Monitors

Total Energy Consumption (E_{TEC}) in kilowatt-hours per year shall be calculated as follows:

$$E_{TEC} = 8.76 \times (0.35 \times P_{ON} + 0.65 \times P_{SLEEP})$$

Where:

P_{ON} = measured On Mode power in watts; P_{SLEEP} = measured Sleep Mode power in Watts;

Total Energy Consumption (ETEC) shall be less than or equal to Maximum allowable Total Energy Consumption in kilowatt-hours per year calculated as follows:

$$E_{TEC_{MAX}} = (1.9 + (0.12 \times A) + [3.1 \times (r + C)]) \times eff_{AC_DC}$$

Where:

eff_{AC_DC} = 1.00 for AC-powered monitors
0.85 for DC-powered monitors

A = viewable screen area in square inches;

r = Total Native Resolution in megapixels; and

C =	-0.84	if $A < 180 \text{ in}^2$
	-0.30	if $180 \text{ in}^2 \leq A < 220 \text{ in}^2$
	-2.06	if $A \geq 220 \text{ in}^2$

Refrigerator-Freezers and Freezers	<p>Product must have an Annual Energy Consumption (AEC) of less than or equal to 637 kWh per year.</p> <p>Side-by-side and bottom freezer product types must be at least 27% more efficient than federal requirements. Top freezers must be at least 10% more efficient than federal requirements. Standard-size chest freezer product types must be at least 15% more efficient than federal requirements. Standard-size upright freezer and compact freezer product types must be at least 20% more efficient than federal requirements. Compact refrigerator or refrigerator-freezer product types must be at least 30% more efficient than federal requirements. Optional reporting of refrigerant type.</p>																
Dehumidifiers	<p>Product must meet the following applicable minimum Integrated Energy Factor (IEF):</p> <table border="1"> <thead> <tr> <th>Type, Size</th> <th>Integrated Energy Factor (IEF)</th> </tr> </thead> <tbody> <tr> <td>Portable, capacity ≤ 25.00 pints/day</td> <td>≥ 1.75</td> </tr> <tr> <td>Portable, capacity 25.01 to 50.00 pints/day</td> <td>≥ 2.01</td> </tr> <tr> <td>Portable, capacity > 50.00 pints/day</td> <td>≥ 3.40</td> </tr> <tr> <td>Whole Home, case volume ≤ 8.0 ft³</td> <td>≥ 2.22</td> </tr> <tr> <td>Whole Home, case volume > 8.0 ft³</td> <td>≥ 3.81</td> </tr> </tbody> </table>	Type, Size	Integrated Energy Factor (IEF)	Portable, capacity ≤ 25.00 pints/day	≥ 1.75	Portable, capacity 25.01 to 50.00 pints/day	≥ 2.01	Portable, capacity > 50.00 pints/day	≥ 3.40	Whole Home, case volume ≤ 8.0 ft ³	≥ 2.22	Whole Home, case volume > 8.0 ft ³	≥ 3.81				
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Dishwashers	<table border="1"> <thead> <tr> <th>Product Type</th> <th>Annual Energy Use (kWh/yr)</th> <th>Water Consumption (gallons/cycle)</th> </tr> </thead> <tbody> <tr> <td>Standard Dishwasher</td> <td>≤ 225</td> <td>≤ 3.2</td> </tr> </tbody> </table>	Product Type	Annual Energy Use (kWh/yr)	Water Consumption (gallons/cycle)	Standard Dishwasher	≤ 225	≤ 3.2										
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Ducted Air Source Heat Pumps	<p>Installation benefits, multiple capacities.</p> <table border="1"> <thead> <tr> <th>Product type</th> <th>SEER2</th> <th>EER2</th> <th>HSPF2</th> </tr> </thead> <tbody> <tr> <td>Split system HP</td> <td>16.9</td> <td>12.0</td> <td>8.1</td> </tr> <tr> <td>Single-package HP</td> <td>15.2</td> <td>11.5</td> <td>7.2</td> </tr> <tr> <td>Cold Climate HP</td> <td>15.2</td> <td>10.0</td> <td>8.1</td> </tr> </tbody> </table> <p>Cold climate heat pumps must also meet a COP of 1.75 at 5 degrees F, and provide 70% capacity maintenance at 5 degrees F.</p>	Product type	SEER2	EER2	HSPF2	Split system HP	16.9	12.0	8.1	Single-package HP	15.2	11.5	7.2	Cold Climate HP	15.2	10.0	8.1
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<p>Ductless Heat Pumps</p>	<p>Multiple capacities.</p> <table border="1"> <thead> <tr> <th>Product type</th> <th>SEER2</th> <th>EER2</th> <th>HSPF2</th> </tr> </thead> <tbody> <tr> <td>Ductless HP</td> <td>16.0</td> <td>12.0</td> <td>9.0</td> </tr> <tr> <td>Ductless Cold Climate HP</td> <td>16.0</td> <td>9.0</td> <td>9.5</td> </tr> </tbody> </table> <p>Ductless cold climate heat pumps must also meet a COP of 1.75 at 5 degrees F, and provide 70% capacity maintenance at 5 degrees F.</p>	Product type	SEER2	EER2	HSPF2	Ductless HP	16.0	12.0	9.0	Ductless Cold Climate HP	16.0	9.0	9.5									
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<p>Geothermal Heat Pumps*</p>	<table border="1"> <thead> <tr> <th>Product type</th> <th>EER</th> <th>COP</th> </tr> </thead> <tbody> <tr> <td>Closed Loop Water-to-Air GHP</td> <td>17.1</td> <td>3.6</td> </tr> <tr> <td>Open Loop Water-to-Air GHP</td> <td>21.1</td> <td>4.1</td> </tr> <tr> <td>Closed Loop Water-to-Water GHP</td> <td>16.1</td> <td>3.1</td> </tr> <tr> <td>Open Loop Water-to-Water GHP</td> <td>20.1</td> <td>3.5</td> </tr> <tr> <td>DGX</td> <td>16.0</td> <td>3.6</td> </tr> <tr> <td>DGX-to-Water</td> <td>15.0</td> <td>3.1</td> </tr> </tbody> </table>	Product type	EER	COP	Closed Loop Water-to-Air GHP	17.1	3.6	Open Loop Water-to-Air GHP	21.1	4.1	Closed Loop Water-to-Water GHP	16.1	3.1	Open Loop Water-to-Water GHP	20.1	3.5	DGX	16.0	3.6	DGX-to-Water	15.0	3.1
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<p>Residential Windows and Sliding Glass Doors</p>	<p>Products must meet these new performance requirements. Changes occur in the SHGC requirements for the South-Central Zone and the U-factor and SHGC requirements of the Southern Zone.</p> <table border="1"> <thead> <tr> <th>Climate Zone</th> <th>U-factor</th> <th>SHGC</th> </tr> </thead> <tbody> <tr> <td>Northern</td> <td>≤0.20</td> <td>≥0.20</td> </tr> <tr> <td>Northern-Central</td> <td>≤0.20</td> <td>≤0.40</td> </tr> <tr> <td>South-Central</td> <td>≤0.20</td> <td>≤0.23</td> </tr> <tr> <td>Southern</td> <td>≤0.21 =0.22</td> <td>≤0.23 ≤0.21</td> </tr> </tbody> </table> <p>Note: SHGC = Solar Heat Gain Coefficient</p>	Climate Zone	U-factor	SHGC	Northern	≤0.20	≥0.20	Northern-Central	≤0.20	≤0.40	South-Central	≤0.20	≤0.23	Southern	≤0.21 =0.22	≤0.23 ≤0.21						
Climate Zone	U-factor	SHGC																				
Northern	≤0.20	≥0.20																				
Northern-Central	≤0.20	≤0.40																				
South-Central	≤0.20	≤0.23																				
Southern	≤0.21 =0.22	≤0.23 ≤0.21																				
<p>Room Air Cleaners</p>	<p>Product must meet the minimum Smoke Clean Air Delivery Rate per Watt (Smoke CADR/W) requirements shown in the table below, as determined by ANSI/AHAM AC-1-2020: Method of Measuring the Performance of Portable Household Electric Room Air Cleaners.</p>																					

	<table border="1"> <thead> <tr> <th>Smoke CADR Bins</th> <th>Minimum Smoke CADR/W</th> </tr> </thead> <tbody> <tr> <td>30 ≤ Smoke CADR < 100</td> <td>5.4</td> </tr> <tr> <td>100 ≤ Smoke CADR < 150</td> <td>6.6</td> </tr> <tr> <td>150 ≤ Smoke CADR</td> <td>7.6</td> </tr> </tbody> </table>	Smoke CADR Bins	Minimum Smoke CADR/W	30 ≤ Smoke CADR < 100	5.4	100 ≤ Smoke CADR < 150	6.6	150 ≤ Smoke CADR	7.6		
Smoke CADR Bins	Minimum Smoke CADR/W										
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Room Air Conditioners	<p>Product must have a Combined Energy Efficiency Ratio (CEER) that is greater than or equal to 35% better than the DOE Federal Minimum Standard.</p> <table border="1"> <thead> <tr> <th>Product Classes</th> <th>Minimum Percent Better than the Federal Standard (%)</th> </tr> </thead> <tbody> <tr> <td>1, 2, 6, and 7</td> <td>35%</td> </tr> <tr> <td>8b and 15</td> <td>46%</td> </tr> <tr> <td>3, 5a, 5b, 8a, 9, 10, 11, 12, 13, 14, 16</td> <td>47%</td> </tr> <tr> <td>4</td> <td>50%</td> </tr> </tbody> </table> <p>Products must also be at or below a maximum sound level of 45 dB(A) for the lowest operational setting.</p> <p>Products with heating capability must report the heating mode efficiency based on the TBD ENERGY STAR Heating Mode Test for Room Air Conditioners.</p>	Product Classes	Minimum Percent Better than the Federal Standard (%)	1, 2, 6, and 7	35%	8b and 15	46%	3, 5a, 5b, 8a, 9, 10, 11, 12, 13, 14, 16	47%	4	50%
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3, 5a, 5b, 8a, 9, 10, 11, 12, 13, 14, 16	47%										
4	50%										
Ventilating Fans	<p>Bathroom/Utility Room:</p> <ul style="list-style-type: none"> Efficacy at high speed ≥ 11.4cfm/W Bathroom and Utility Room Fans must provide a sound level ≤ 4.0 sones at 0.25 inches of water gauge external static pressure at high speed. <p>Inline Fan:</p> <ul style="list-style-type: none"> Efficacy ≥ 6.5 cfm/W In-Line Fans with Filter: 6 ≤ MERV ≤ 13: 4.7 cfm/W 										

**Proposed criteria carried over from 2023 for these categories with no changes.*

ENERGY STAR Most Efficient 2024 Recognition

ENERGY STAR certified products meeting these requirements will be highlighted as ENERGY STAR Most Efficient for 2024 at: www.energystar.gov/moste efficient beginning January 1, 2024. Shortly, EPA will begin distributing the 2024 ENERGY STAR Most Efficient designation to brand owners of eligible products. As a reminder, usage guidelines are available at [Guidelines for Using the ENERGY STAR Most Efficient Mark](#).

To ensure the greatest utility of the ENERGY STAR Most Efficient webpage to consumers, EPA will only highlight products that are currently available for sale in the U.S. As such, EPA reminds partners that it is critical to keep product availability information with their certification bodies current. Partners are also reminded that they must provide all information called for by the recognition criteria to their certification body at the time of certification in order to be recognized as ENERGY STAR Most Efficient. While it is our intention to begin automatically nominating window products for Most Efficient recognition in 2024, until that time, partners will need to apply for recognition for all products new to ENERGY STAR Most Efficient in order for the Agency to verify that a product meets the recognition criteria. EPA will share updates on the auto nominating process as they are available. Lastly, EPA will also review currently recognized product lines to see which may meet the new Southern zone recognition criteria.

The ENERGY STAR Most Efficient 2024 designation is intended for use at point-of-sale on point-of-purchase materials, product literature, and websites. It may not be factory-applied to products or product packaging. Failure to abide by these guidelines may result in loss of recognition. EPA will highlight recognized products on the ENERGY STAR Most Efficient 2024 web page through December 31, 2024.



We look forward to working with you to market ENERGY STAR Most Efficient products in 2024. Please e-mail mostefficient@energystar.gov with any questions.

Thank you for your support of the ENERGY STAR program.

Sincerely,

A handwritten signature in black ink, appearing to read "Ann Bailey".

Ann Bailey, Director
ENERGY STAR Product Labeling