



ENERGY STAR®

Most Efficient 2019 Update and 2020 Criteria

August 7, 2019

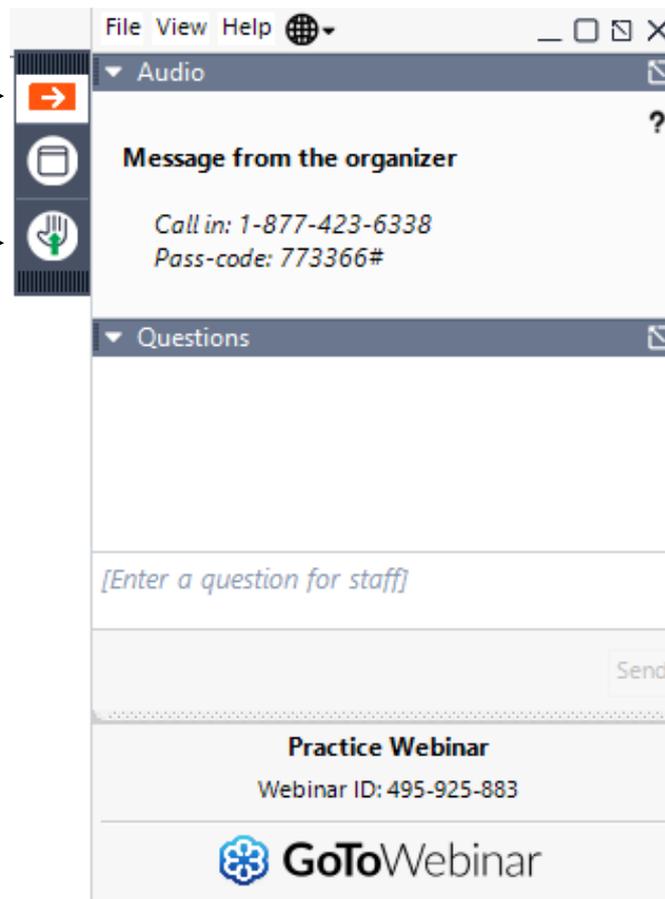
2-4pm ET

Using GoToWebinar and Audio Controls

Use this button to expand or minimize your toolbar at any time.

Click here to raise your hand. Doing so will indicate that you would like to speak to the audience.

To unmute your line, press *6.



Dial in via telephone, enter your audio PIN, and press #.

Everyone will join unmuted. Please mute your line when not speaking. To mute your line, press *6.

You can type in questions at any time and we'll answer them in between presentations or at the end of the webinar.



ENERGY STAR Most Efficient

- An extension of the **trusted** ENERGY STAR brand
- Recognizing the **most efficient** products among those that qualify for ENERGY STAR in a given year
- Target audience: environmentally conscious, early adopters
- Represents the **“best of the best”** in energy efficient products
- Each year, we review our criteria and raise the bar as needed to ensure ENERGY STAR Most Efficient is awarded to only the top performers



ENERGY STAR Most Efficient 2019

Update: Recognizing the Best from Range of Partners (July)

Product Category	Models	ENERGY STAR Partners
Boilers	545	31
Ceiling Fans	104	10
Central Air Conditioners and Air Source Heat Pumps	187	8
Clothes Dryers	21	6
Clothes Washers	26	4
Computer Monitors	181	21
Dehumidifiers	11	4
Dishwashers	91	8
Furnaces	141	7
Geothermal Heat Pumps	611	10
Refrigerators-Freezers	391	32
Televisions	6	6
Ventilating Fans	38	9
Windows	458	42
Total*	2,811	175



ENERGY STAR Most Efficient 2019

Update: Growing Utility Collaboration

- Over 30 energy efficiency program sponsors are leveraging ENERGY STAR Most Efficient.
 - Serving over 13 million households (30 million consumers).
 - Featuring one or more Most Efficient product categories
- ENERGY STAR Most Efficient leveraged for retailer incentives through ENERGY STAR Retail Products Platform (ESRPP)
 - Innovative, nationally coordinated, market transformation initiative
 - 2016: 3 retailers, 8 energy efficiency program sponsors representing 11 states and almost 18% of the U.S. 5 ENERGY STAR categories; 700 stores.
 - 2017: Lowe's, Nationwide Marketing Group, new program sponsors join ESRPP retailers represent >70% of appliance market; > 1,000 stores
 - Future: ESRPP striving for large-scale market participation – serving more than 30% of the US population – a key milestone in the ESRPP vision to transform the market for energy efficient consumer products



ENERGY STAR Most Efficient 2019 Update: Added Web Highlighting

- ENERGY STAR Most Efficient website:
 - Includes product images and real-time information on retail pricing and where to locate and buy these models
 - Now available for clothes washers, dryers, dishwashers, monitors, refrigerators, and ventilating fans found at select major retailers
 - Available for ceiling fans, dehumidifiers, and TVs by Fall 2019



ENERGY STAR Most Efficient Categories in 2020

- Boilers
- Ceiling and Ventilating Fans
- CAC/ASHP
- Clothes Washers
- Computer Monitors
- Dehumidifiers
- Dishwashers
- Dryers
- Furnaces
- Geothermal Heat Pumps
- Refrigerators- Freezers, Freezers, and Compact Products
- **NEW!** Room Air Conditioners
- TVs
- Windows



Draft 2020 ENERGY STAR Most Efficient Recognition Criteria





Dishwashers



- **2020 Proposal:**
 - Maintain current criteria for Standard models
 - Annual Energy Use \leq 240 kWh/yr
 - Water Use \leq 3.2 Gallons/cycle
 - Minimum per cycle Cleaning Index of 70, for heavy, medium, and light soil load cycles
 - Submit at the time of certification
 - Average cleaning index for all units in the sample
- **Rationale:**
 - Currently, 31 base models from 9 brands (Asko, Beko, Blomberg, Fulgor Milano, Miele, Samsung, Smeg, Summit, Viking) are on our Most Efficient list
 - Increase from 18 to 31 Most Efficient base models in the past year
 - A dishwasher meeting the ENERGY STAR Most Efficient 2020 proposal saves 22% energy and 36% water compared to the federal minimum



Clothes Washers

- **2020 Proposal:**
 - Maintain current energy and water criteria for clothes washers:
 - ≤2.5 cu-ft: IMEF ≥ 2.2, IWF ≤ 3.7
 - >2.5 cu-ft: IMEF ≥ 2.92, IWF ≤ 3.2
 - Maintain minimum cleaning performance level (total cleaning score, CS_t) of ≥ 85
- **Rationale:**
 - Recognizes ~23 models from 4 brands (Electrolux, Kenmore, LG, and Samsung)
 - Significant average energy and water savings:
 - Large volume: 46% less energy and 49% less water than a conventional model
 - Small volume: 24% less energy and 37% less water than a conventional model



Clothes Dryers

- **2020 Proposal:**
 - Maintain current criteria for all dryer product types, except for compact ventless 240V product types
 - Propose to consolidate all electric products under the Electric (All Other) class (no longer include discrete 240V category)
 - All ESME compact ventless 240V models meet the more stringent level for Electric product types
 - Test per DOE test method: normal cycle with max dryness setting,



Cycle Setting	Product Type	CEFBASE (lbs/kWh)
Normal	Electric	≥ 4.30
	Gas	≥ 3.80
Normal, Maximum Dryness	Electric	≥ 3.93
	Gas	≥ 3.48



Clothes Dryers

- **Rationale:**
 - The number of dryers on the 2019 Most Efficient list with the max dry criteria grew steadily throughout the year
 - There are 16 base models from 7 brands (Asko, Beko, Blomberg, LG, Miele, Samsung, Whirlpool) that meet the max dry cycle criteria
 - Dryers that use heat pump or hybrid heat pump technologies are identified on the QPL
 - EPA encourages partners to complete this optional field during certification; enables utilities to easily incentivize
 - A clothes dryer that meets the ENERGY STAR Most Efficient 2020 proposed criteria saves 28% energy for standard-sized electric models, 30-51% energy for compact models, and 25% energy for gas models as compared to the federal minimum



Refrigerators



- **2020 Proposal:**
 - Maintain current criteria for Top Freezer Product Type
 - $\geq 10\%$ more efficient than the Federal minimum
 - Maintain current criteria for Side-by-side and Bottom Freezer Product Types
 - $\geq 20\%$ more efficient than the Federal minimum
 - Enable optional reporting for refrigerant type
- **Rationale:**
 - EPA estimates ≥ 148 base models from 40 brands meet the criteria
 - Levels for top freezers remained the same for 2019, and product count only slightly increased (132 \rightarrow 136 models)
 - Top freezers remain the lowest energy-consuming standard-size refrigerator-freezer product type
 - Levels for side-by-side and bottom freezers were raised in 2019.
 - EPA is including an optional reporting of refrigerant type in response to requests from multiple utilities



Freezers

- **2020 Proposal:**
 - Introduce criteria for standard-size freezer product types
 - $\geq 15\%$ more efficient than the Federal minimum
 - Enable optional reporting for refrigerant type
- **Rationale:**
 - The ENERGY STAR Retail Products Platform (ESRPP) currently incentivizes freezers at this level within their advanced tier.
 - Based on EPA’s analysis, there are at least 29 upright and chest freezer base models that could meet this level if rated 5% below their current rated energy consumption while still having at least a 5% cushion between the tested and rated values.
 - Enabling optional reporting of refrigerant type in response to requests from multiple utilities



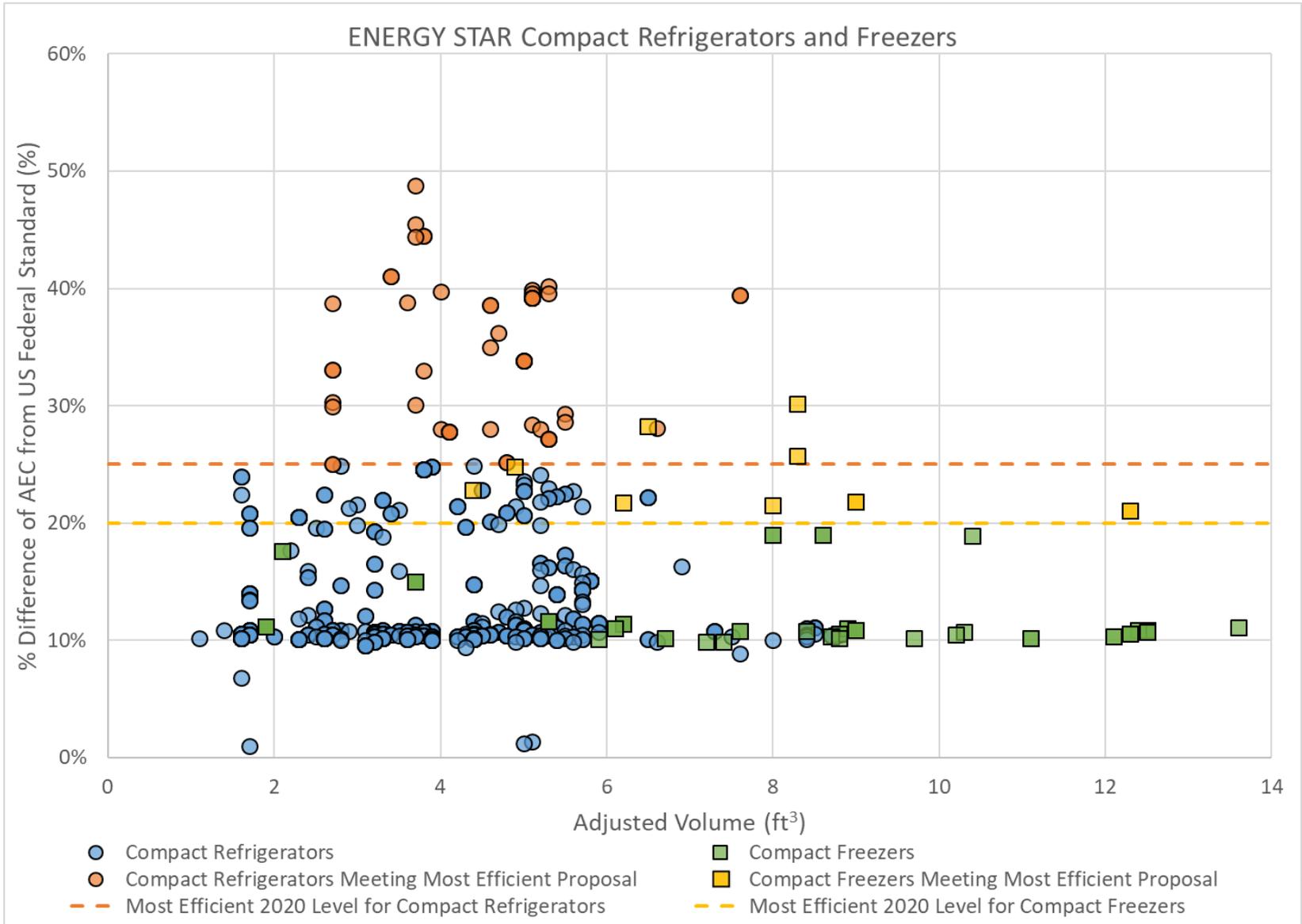


Compact Refrigerators and Freezers

- **2020 Proposal:**
 - Introduce criteria for compact refrigerator and refrigerator-freezer product types
 - $\geq 25\%$ more efficient than the Federal minimum for compact refrigerators and refrigerator-freezers
 - Introduce criteria for compact freezer product types
 - $\geq 20\%$ more efficient than the Federal minimum for compact freezers
 - Enable optional reporting for refrigerant type
- **Rationale:**
 - EPA estimates there are currently ≥ 58 compact refrigerator and refrigerator-freezer base models from 17 brands that meet the criteria
 - EPA estimates there are currently ≥ 10 compact freezer base models from 6 brands that meet the criteria
 - Including an optional reporting of refrigerant type in response to requests from multiple utilities



Compact Refrigerators and Freezers





Room Air Conditioners



- **2020 Proposal:**
 - Introduce criteria for room air conditioner product types:

Cooling Capacity (BTU/hour)	Percent Better than the Federal Standard (%)
< 14,000	25%
≥ 14,000	35%

- Product must have a sound pressure level at or below 45 dB(A) for the lowest operational mode available
 - Demonstrate in accordance with an internationally recognized ISO or ANSI test procedure measuring sound pressure
 - Document adjustments and submit at the time of certification for each basic model
- Enable optional reporting for refrigerant type
- EPA proposed the addition of efficient variable output room air conditioners because they reflect a technology and efficiency leap in line with the Most Efficient goals.



Room Air Conditioners

- The proposed criteria are similar to 2019 Emerging Technology Award
 - The noise requirement arose from discussion with brand owners who were introducing efficient variable output units
 - They indicated that quieter operation is a benefit of this technology and a means of differentiating variable output room air conditioners, that offer an enormous leap in efficiency, from others
 - Test data demonstrated that 45 dB(A) is a reasonable floor that is achievable by variable output products
- Currently 4 models from one brand will meet the proposed criteria and EPA anticipates more models/brands will be on the market in 2020
- EPA proposes including optional reporting of refrigerant type in response to requests from multiple utilities



Ceiling Fans



- **2020 Proposal:** Maintain 2019 product types. Clarify requirements by introducing ENERGY STAR Most Efficient level for **Low-Mount High Speed Small Diameter (HSSD)** fans at the same level as the DOE minimum efficiency standard
 - Standard & Hugger Fans:
 - $D \leq 36$ inches: Efficiency $\geq 1.03D + 60.43$
 - $D > 36$ inches: Efficiency $\geq 3.88D - 42.17$
 - For Low-Mount HSSD
 - $\geq 4.16D + 0.02$



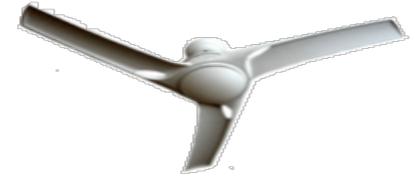
Ceiling Fans



- **Rationale: Low-Mount High Speed Small Diameter (HSSD)**
 - Tip speed interpretation allows some residential fans to be classified as HSSD, which has a higher federal minimum efficiency level than the standard fan ESME level
 - These high-speed fans are a very high efficiency option for residential applications
 - Proposal for ENERGY STAR Most Efficient recognition at the DOE minimum efficiency level allows all Low-mount HSSDs to be recognized as ENERGY STAR Most Efficient



Ceiling Fans



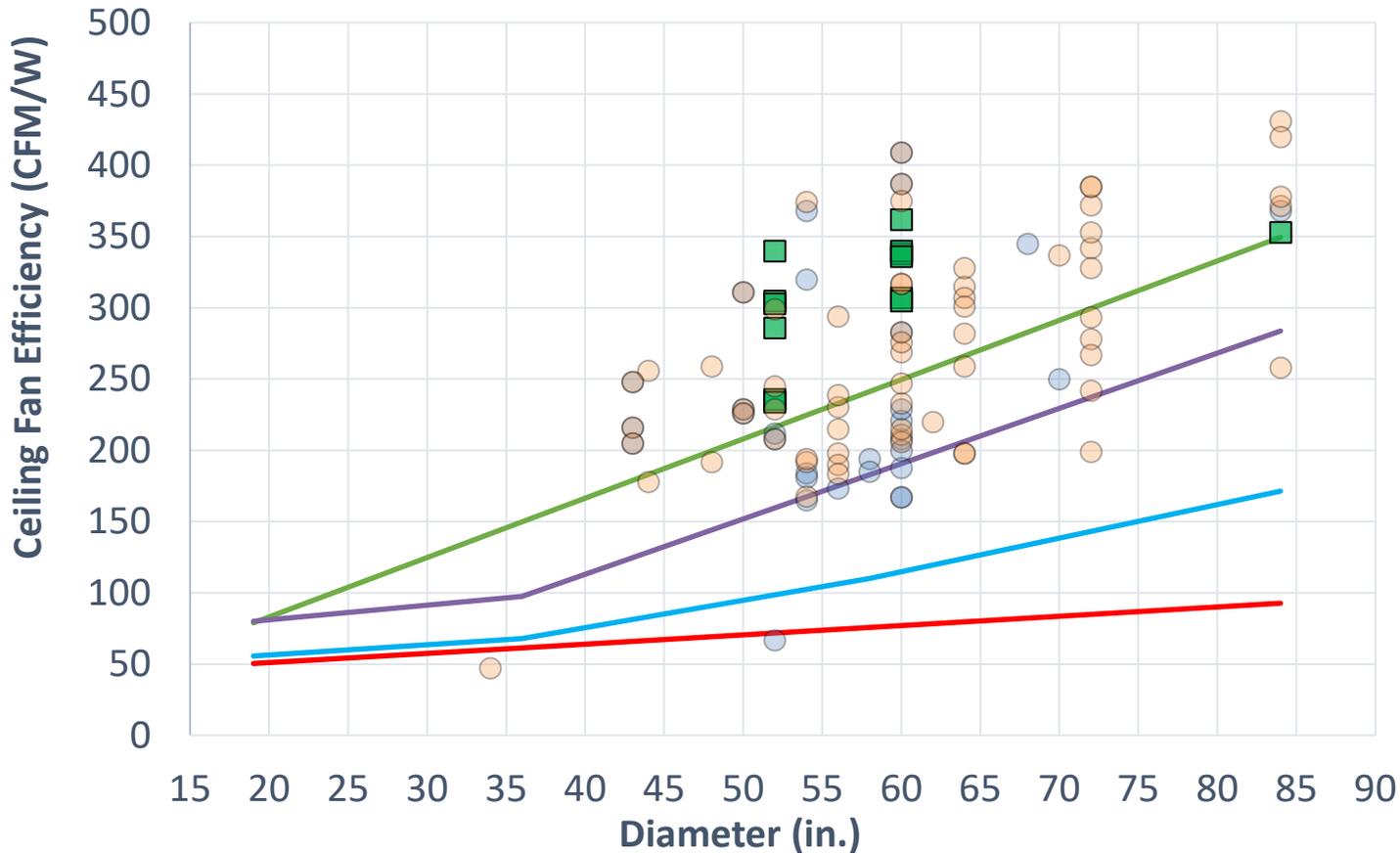
- **Rationale: Standard & Hugger**
 - Standard & Hugger fan criteria is still very stringent
 - 115 Models Certified total, 100 meet ENERGY STAR Most Efficient
 - High percentage of ENERGY STAR QPL, but the QPL is a small subset of the market



Ceiling Fans



All ENERGY STAR Listed Ceiling Fan Products



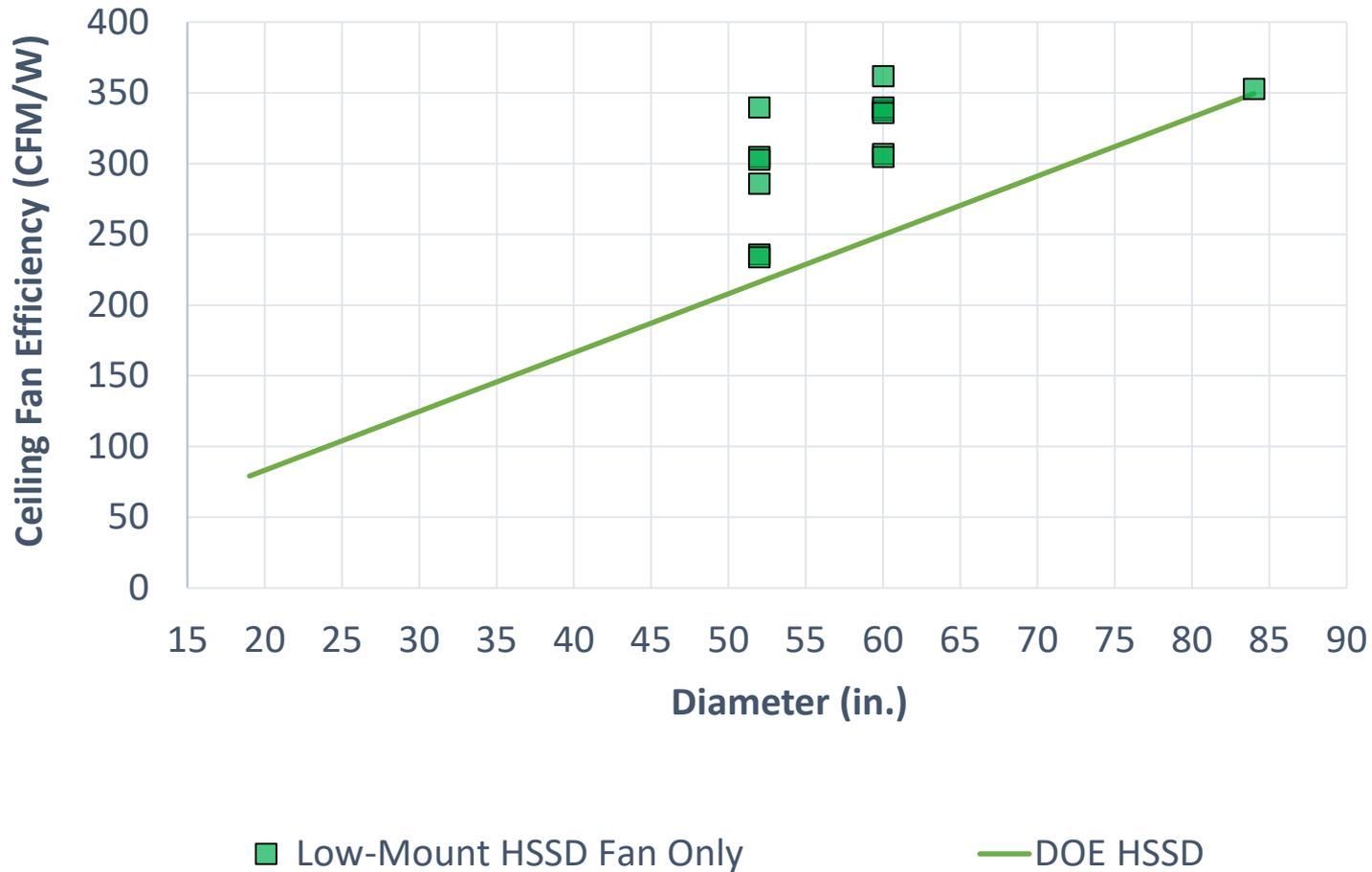
- Low-Mount HSSD Fan Only
- Standard Fan Only
- Standard Fan with Light Kit
- DOE HSSD
- DOE Standard
- ENERGY STAR Standard
- Most Efficient Standard



Ceiling Fans



ENERGY STAR Listed Low-Mount HSSD Products





Ventilating Fans



- **2020 Proposal:**

Maintain B/U room and in-line fans criteria

- Bathroom/Utility room fans

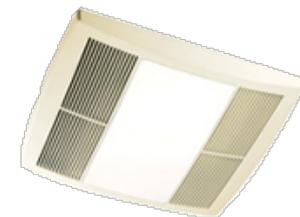
- Efficacy at high speed (cfm/W): ≥ 10
- Reported sound level (sones): ≤ 4.0 at 0.25 in. w.g. at high speed

- In-line fans

- Without filter - Efficacy (high speed) (cfm/W): ≥ 5
- $6 \leq \text{MERV} < 13$ - Efficacy (high speed) (cfm/W): ≥ 4.7
- $\text{MERV} \geq 13$ - Efficacy (high speed) (cfm/W): ≥ 3.8



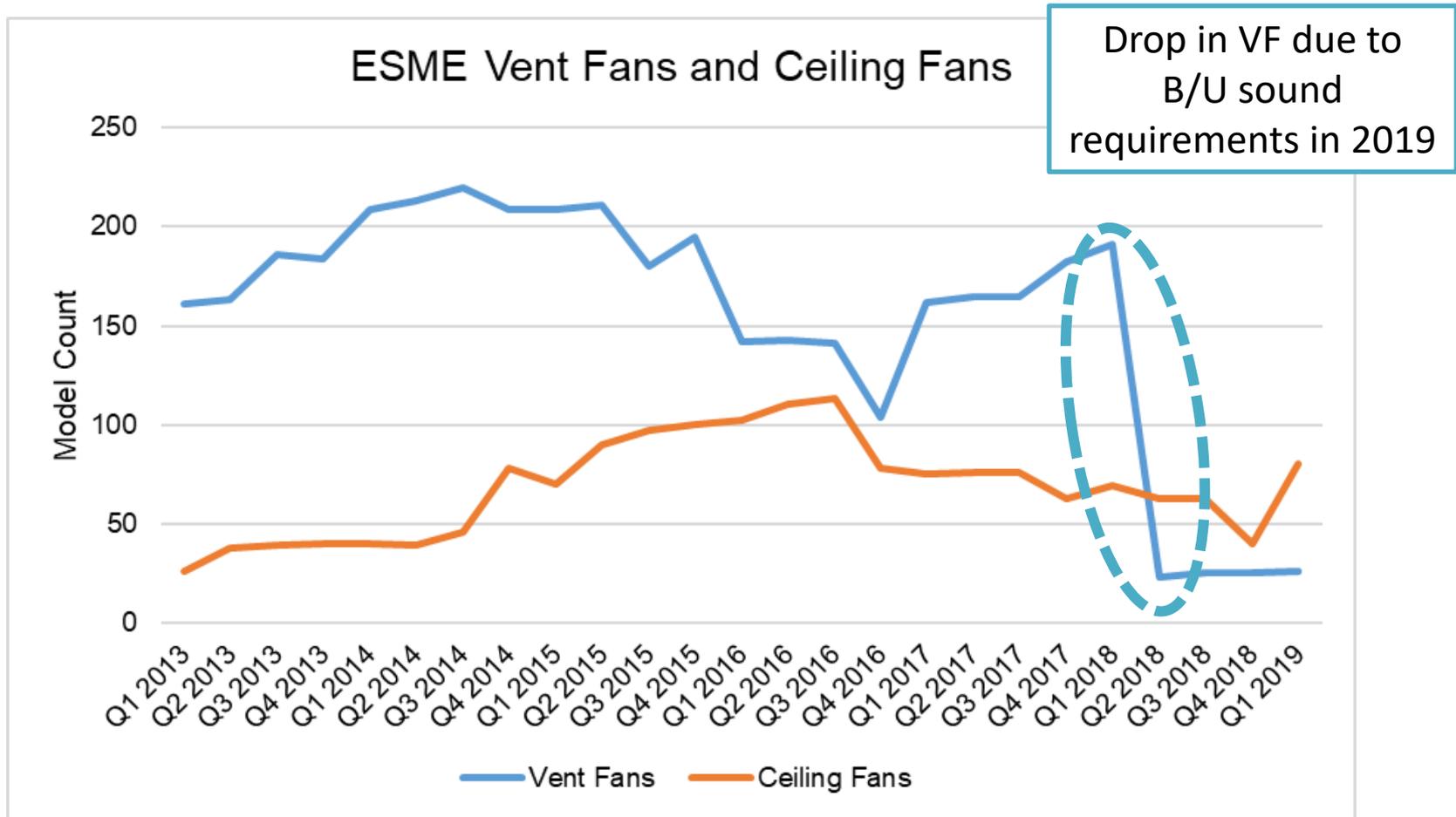
Ventilating Fans



- **Rationale:**
 - Added sound criteria in 2019 for Bathroom/Utility room products: many meet efficacy criteria but most have not submitted data for Sound Level at 0.25 in. w.g.
 - Efficacy levels for inline fans still offer high level of differentiation
 - High efficacy range hood market is still too limited for inclusion– very few models with efficacy above 5.0 cfm/W



Ceiling and Ventilating Fans





CAC, ASHP, GHP, Furnaces

- Current Categories:
 - Non-Ducted Split Air Conditioners and Heat Pumps
 - Centrally Ducted Air Conditioners and Heat Pumps
 - Geothermal Heat Pumps
 - Furnaces
- These products must demonstrate they meet system status and messaging criteria. To aid in the submission and review process, the former narrative submission (following an EPA-provided guide) will be replaced with an application.



System Status and Messaging Criteria

- **2020 Proposal:** Maintain 2019 criteria
 - Unit Setup Information
 - Fault History
 - Resident Alerts in Plain Text

Variable capacity and installed efficiency

- **2020 Proposal:** Maintain 2019 criteria
 - Provide heating and cooling at two or more capacity levels
 - Water-to-water GHP are exempt from this requirement



Non-Ducted Split Air Conditioners and Heat Pumps



- **2020 Proposal:** Maintain current performance, system status and messaging, and capacity criteria;
 - 20 SEER; 12.5 EER; 10 HSPF (HSPF for heat pumps only)
 - Products must be able to provide heating and cooling (as applicable) at two or more capacity levels
- **Rationale:**
 - While rated performance requirements are not exclusive, the system status and messaging criteria are:
 - 0.9% of AC models and 1.3% of HP models are recognized among those in AHRI directory within scope



Centrally Ducted Air Conditioners and Heat Pumps



- **2020 Proposal:** Maintain current performance, system status and messaging, and two capacity criteria;
- **Rationale:**
 - Current criteria continue to recognize a select group of extremely efficient products with features facilitating quality installation and maintenance
 - Small percentage of products recognized among those in the AHRI directory that are in scope:
 - Centrally ducted split and packaged ACs and HPs: 0.0077%



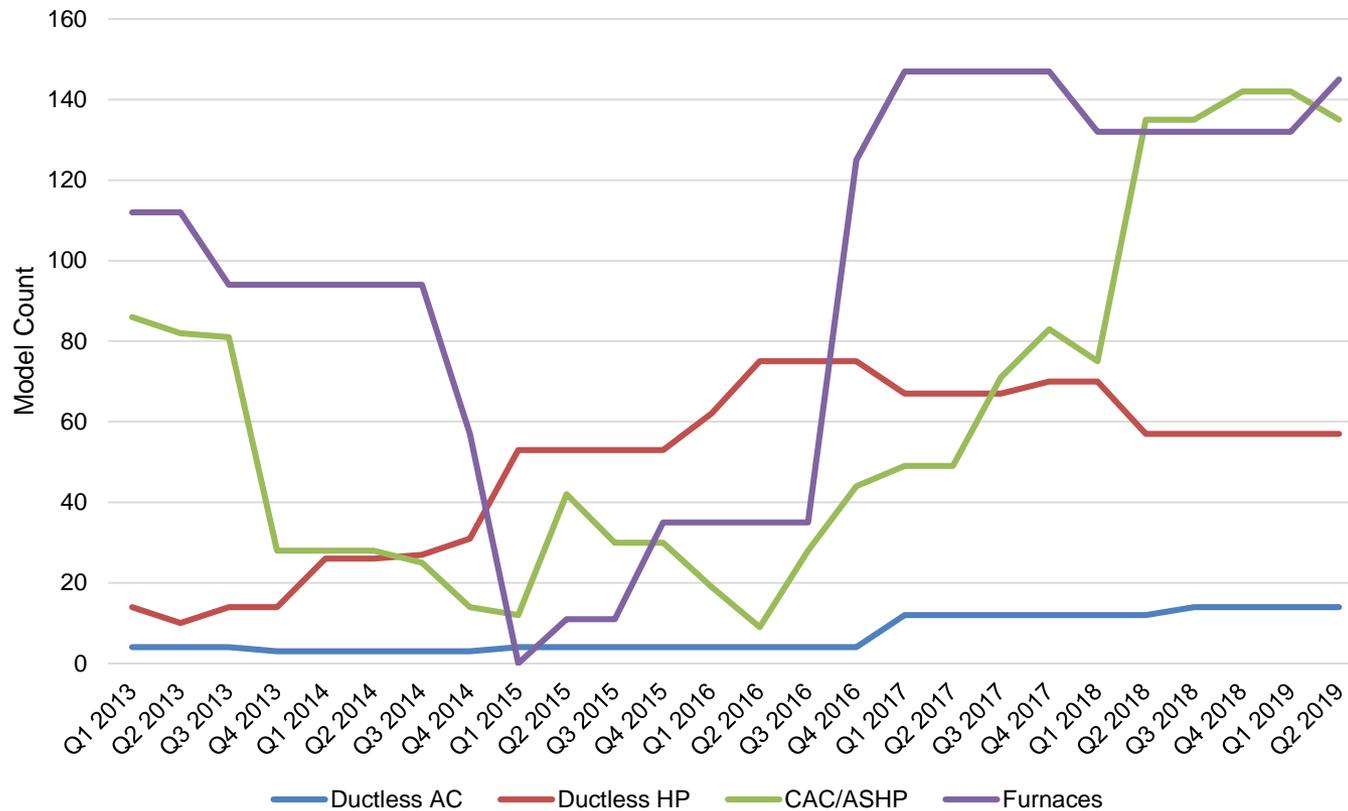
Savings for Air Conditioners and Heat Pumps

System Type	SEER	EER	HSPF	Savings (North)	Savings (South)
Split CAC	18.0	13.0	-	28%	22%
Split ASHP	18.0	12.5	9.6	22%	22%
Packaged CAC	16.0	12.0	-	13%	13%
Packaged ASHP	16.0	12.0	8.2	10%	10%
Non-Ducted CAC	20.0	12.5	-	35%	30%
Non-Ducted ASHP	20.0	12.5	10.0	25%	25%



Air Conditioners and Heat Pumps

ESME Heating and Cooling Products





Geothermal Heat Pumps

- **2020 Proposal:** Maintain current performance, system status and messaging, and two capacity criteria
- **Rationale:**
 - Current criteria continue to recognize a select group of extremely efficient products with features facilitating quality installation and maintenance
 - 3.8% percent of listed products in the AHRI directory are recognized as ENERGY STAR Most Efficient

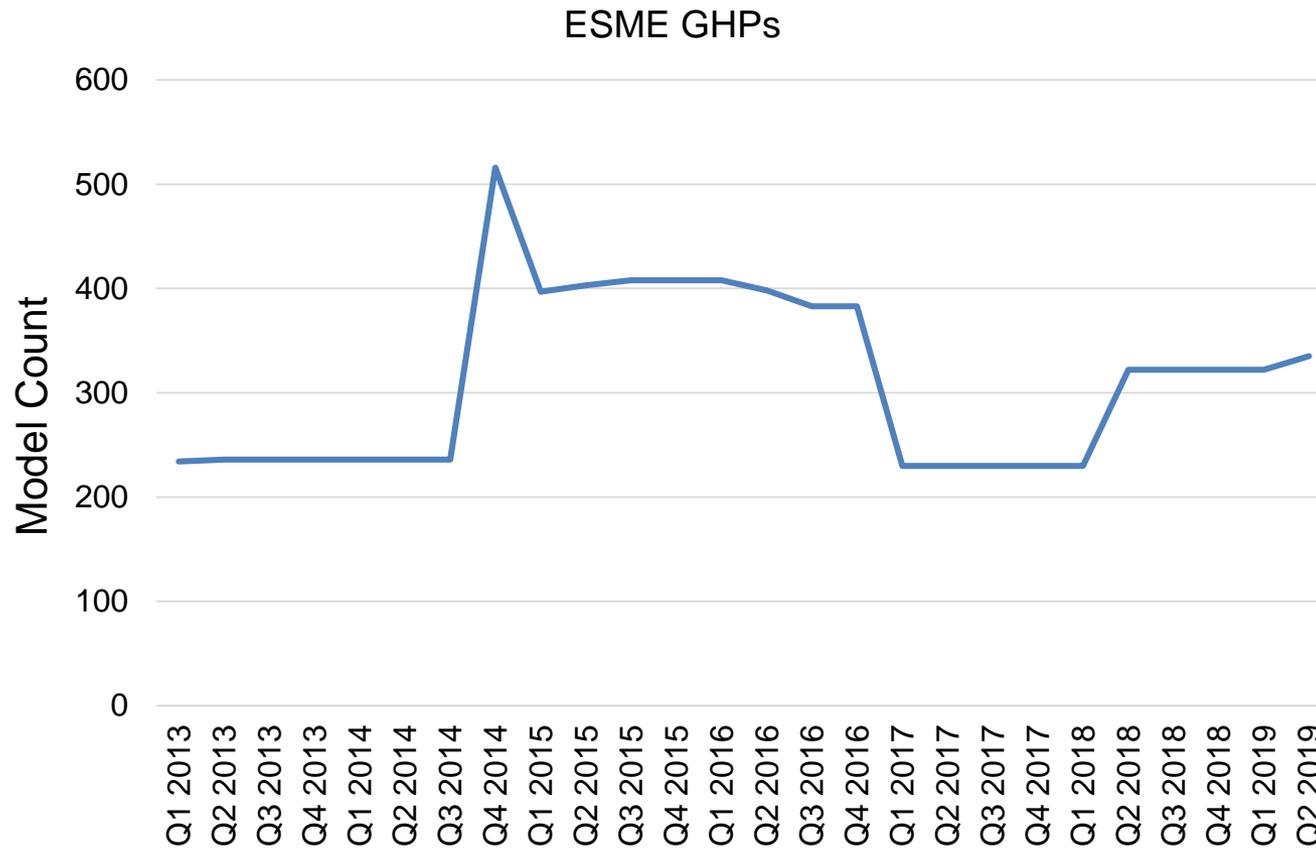


Geothermal Heat Pumps

System Type	EER	COP	Savings
Closed Loop Water-to-Air GHP	17.1	3.6	36%
Open Loop Water-to-Air GHP	21.1	4.1	44%
Closed Loop Water-to-Water GHP	16.1	3.1	28%
Open Loop Water-to-Water GHP	20.1	3.5	36%
DGX	16.0	3.6	36%



Geothermal Heat Pumps





Furnaces

- **2020 Proposal:** Maintain current performance and system status and messaging criteria
 - ≥ 97 AFUE
- **Rationale:**
 - AFUE requirement alone offers great differentiation of products and is aligned with CEE Tier 3
 - 1.1% of models recognized among those in AHRI directory meet AFUE criteria

System Type	Savings
Gas	18%



Boilers



- **2020 Proposal:** Maintain current performance criteria
 - Gas Powered Boilers: ≥ 95 AFUE
 - Oil Powered Boilers: ≥ 90 AFUE
- **Rationale:**
 - Opportunities for additional distinctions not identified
 - No obvious opportunity to address proper installation as few boilers are sold with controllers
 - Potential for better installed efficiency with Indoor Temperature reset, but it is not common as it requires full system integration.

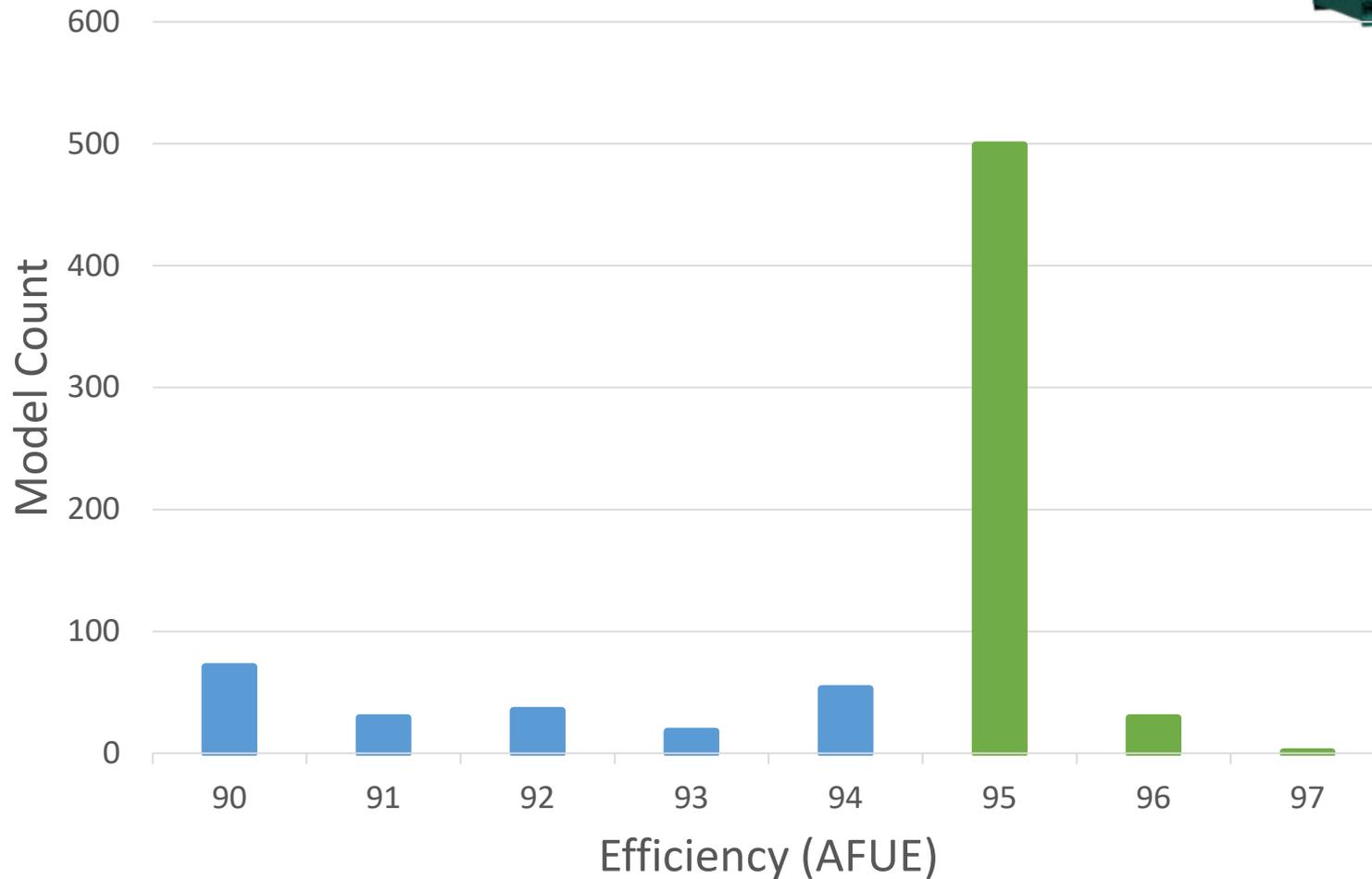
System Type	Savings
Gas	14%
Oil	7%



Boilers



ENERGY STAR Gas Boiler Distribution

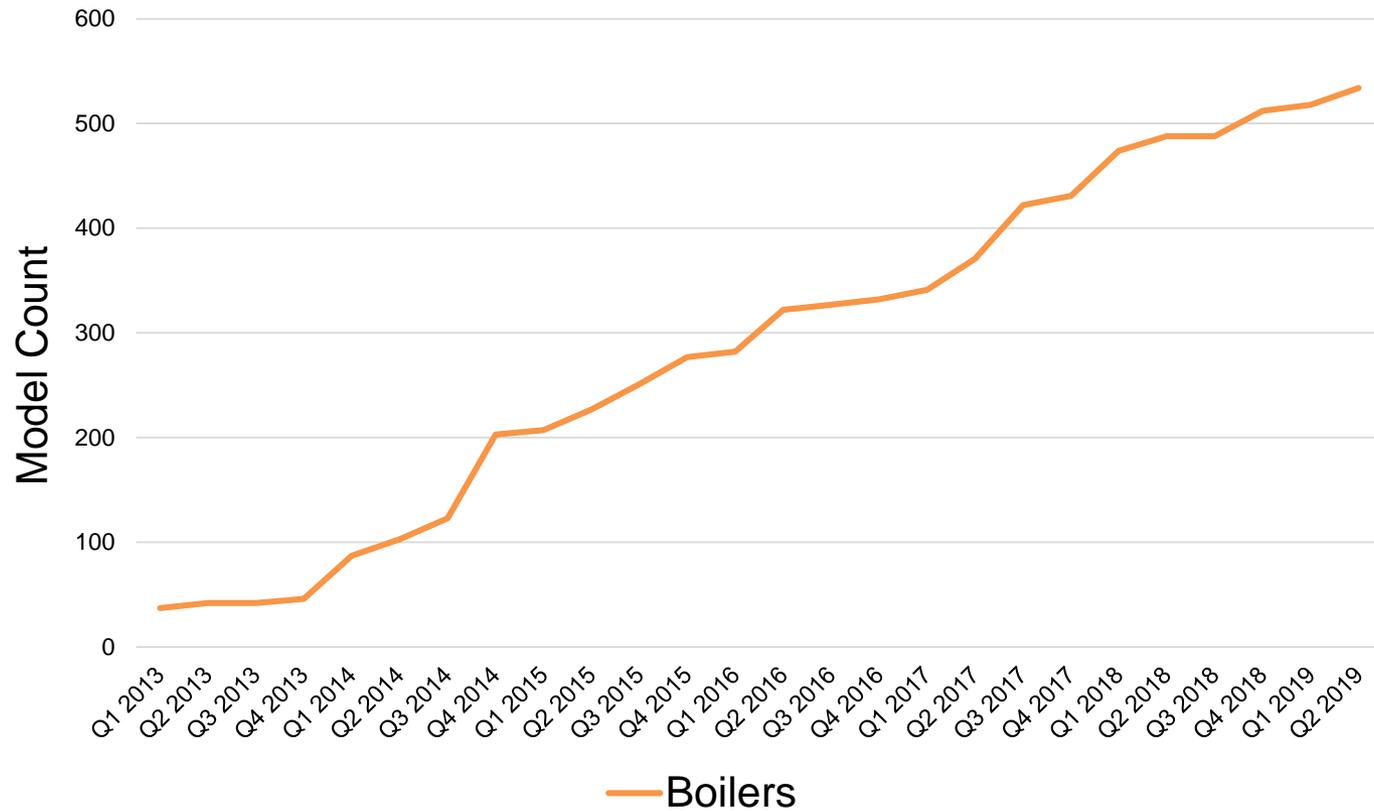




Boilers



ESME Boilers





HVAC Application Updates

- **2020 Proposal:** Update existing narrative guide to a new HVAC Product Application.
 - Fillable PDF will clearly indicate which information is necessary.
 - Update questions for clarity, add examples.
- **Rationale:**
 - Encourage complete applications which are uniform and easier to evaluate
 - Reduce stakeholder confusion
- **Timing:**
 - Updated application will be available for ESME 2020 recognition on or before 1/1/2020



Dehumidifiers

- Most Efficient Criteria for Dehumidifiers for 2020 are under development
- Due to the metric change to IEF, EPA delaying release until sufficient market data available
- EPA will release a proposal for stakeholder review and comment this fall



Computer Monitors



- 2020 Proposal:**

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 (E_{TEC}) 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:

A = viewable screen area in square inches;

r = Total Native Resolution in megapixels up to 5.0 megapixels total. Products with >5.0 megapixels Total Native Resolution can receive a maximum r of 5 megapixels; and

$$c = \begin{cases} 1.2 & \text{if } A < 180 \text{ in}^2 \\ 2.0 & \text{if } 180 \text{ in}^2 \leq A < 220 \text{ in}^2 \\ 1.2 & \text{if } A \geq 220 \text{ in}^2 \end{cases}$$

$$eff_{AC_DC} = \begin{cases} 1.00 & \text{for AC-powered monitors} \\ 0.85 & \text{for DC-powered monitors} \end{cases}$$

Computer Monitors



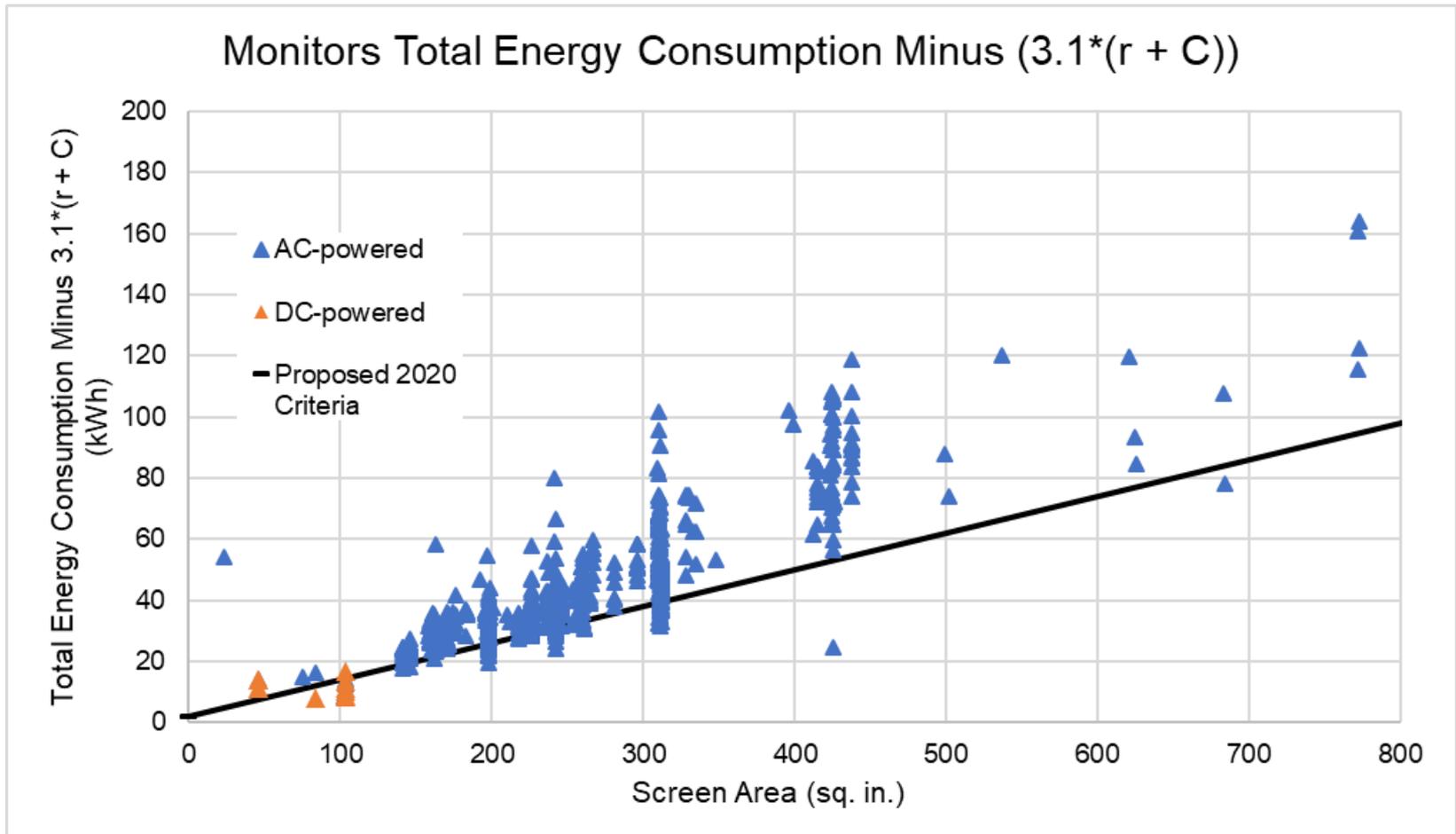
- **Rationale:**

- EPA's proposal for 2020 is structurally similar to the 2019 criteria
- The levels of c (the E_{TEC_MAX} intercept) are slightly lower to differentiate the most efficient subset of models meeting Version 8.0
- Adding the AC-DC conversion factor will recognize AC- and DC-powered monitors fairly
- The proposed 2020 criteria recognize 6% of models in the current Version 7.0 dataset and 21% of models meeting the Version 8.0 criteria

Area	Total Monitors in Dataset (V7)	# Meeting V8	# Meeting ESME 2020	% of V7 Meeting ESME 2020	% V8 Meeting ESME 2020 (projected)
<180insq	131	45	10	8%	22%
180-220	195	57	14	7%	25%
220>=	676	202	41	6%	20%
All	1002	304	65	6%	21%



Computer Monitors





Televisions



- **2020 Proposal:**
 - Products must be certified to the Version 8.0 Program Requirements
 - The On Mode Power shall be less than or equal to the sum of the maximum allowable On Mode Power consumption and high resolution allowance:
 - $P_{ON_MAX} = 66 \times \tanh(0.000412 [A - 140] + 0.014) + 14$
 - And an allowance for UHD models (P_{HR})
 - $P_{ON} \leq P_{ON_MAX} + P_{HR}$
 - $P_{HR} = 0.45 \times P_{ON_MAX}$

Where:

- P_{ON} is the On Mode Power in watts;
- P_{ON_MAX} is the maximum allowable On Mode Power consumption in watts;
- P_{HR} is the high resolution On Mode Power Allowance in watts;
- A is the viewable screen area of the product in square inches; and
- \tanh is the hyperbolic tangent function.



Televisions Most Efficient 2020 Anticipated Savings

- **Rationale:**

- EPA proposes to maintain the existing ENERGY STAR Most Efficient 2019 criteria for 2020. ENERGY STAR Version 8.0 took effect in March 2019. The QPL is limited. EPA sees value in maintaining recognition as partners consider options for delivering top performance along with superior efficiency going forward.
- The 2019 savings estimates are displayed but may be refined as more products begin to certify to the Version 8.0 specification.

Area (sq. inches)	ESME 2020 % Energy Savings over V7.0
<650	18%
650-900	23%
900-1200	23%
>1200	17%
All	22%



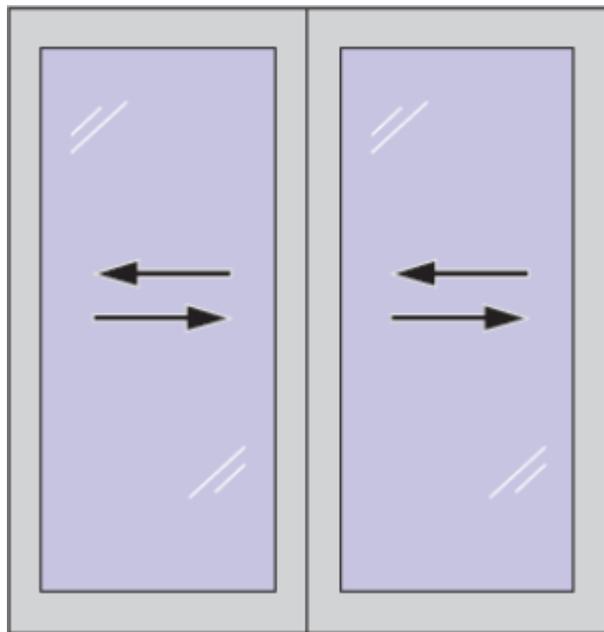
Residential Windows (and sliding glass doors)

- **2020 Proposal:**
 - Maintain current U-factor and SHGC criteria for Windows
 - Expand the ENERGY STAR Most Efficient category for windows to include sliding glass doors using the same recognition criteria as windows
 - This would apply only to sliding glass doors with NFRC operator type DDSG
- **Rationale:**
 - Products with performance significantly higher than ENERGY STAR criteria are widely available; but still a relatively small slice of total market
 - 42 manufacturers and 458 product lines
 - Sliding Glass Doors are similar in form to windows (mostly glass, narrow frames) so performance levels reasonable
 - Similar look and reflected color – so uniform packages of Most Efficient products can be marketed

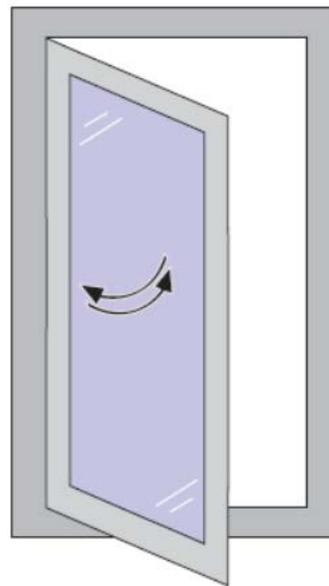
Residential Windows (and sliding glass doors)

- **Comparing products:**

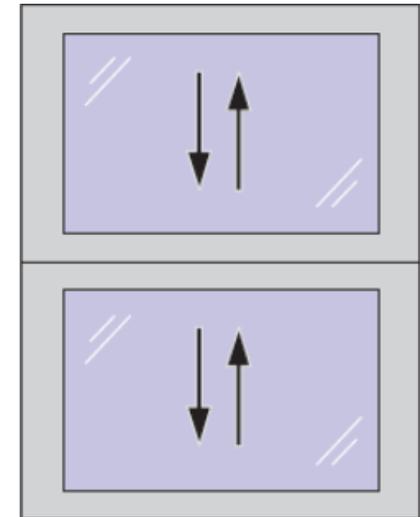
Sliding Glass Doors



Casement



Vertical Slider (Double-hung)



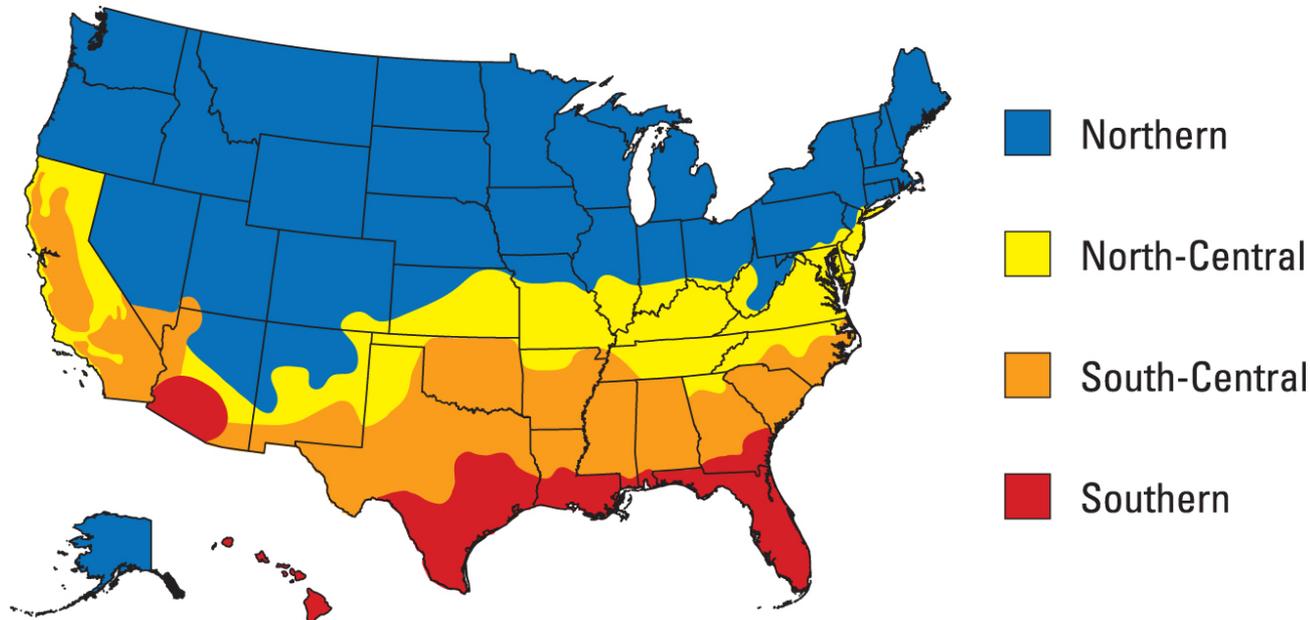
Courtesy NFRC

- Discussions are still on-going on the development of a dynamic window product specification – issue included in the forthcoming ENERGY STAR Windows Discussion Guide



Residential Windows (and sliding glass doors)

Climate Zone	U-factor	SHGC
Northern	≤ 0.20	≥ 0.20
North-Central	≤ 0.20	≤ 0.40
South-Central	≤ 0.20	≤ 0.25
Southern	≤ 0.20	≤ 0.25





Next Steps

- Written comments on the Proposed Criteria are due no later than August 22, 2019 to mostefficient@energystar.gov
- EPA will finalize the 2020 criteria in August 2019 or early September 2019
- Products will be recognized as ENERGY STAR Most Efficient 2020 beginning January 1, 2020



Contacts

Doug Anderson, EPA-Windows, anderson.doug@epa.gov

Abigail Daken, EPA-HVAC, daken.abigail@epa.gov

Katharine Kaplan, EPA Team Lead, Kaplan.katharine@epa.gov

James Kwon, EPA-Electronics, kwon.james@epa.gov

Ga-Young Park, EPA-Appliances, park.ga-young@epa.gov

Jeremy Dommu, DOE Team Lead, jeremy.dommu@ee.doe.gov

Rachel Selbert, ICF-Product Recognition, rachel.selbert@icf.com

General Inquiries: mostefficient@energystar.gov

Thank you for your participation today.