



ENERGY STAR[®]

Most Efficient 2020 Update and 2021 Criteria

July 15, 2020

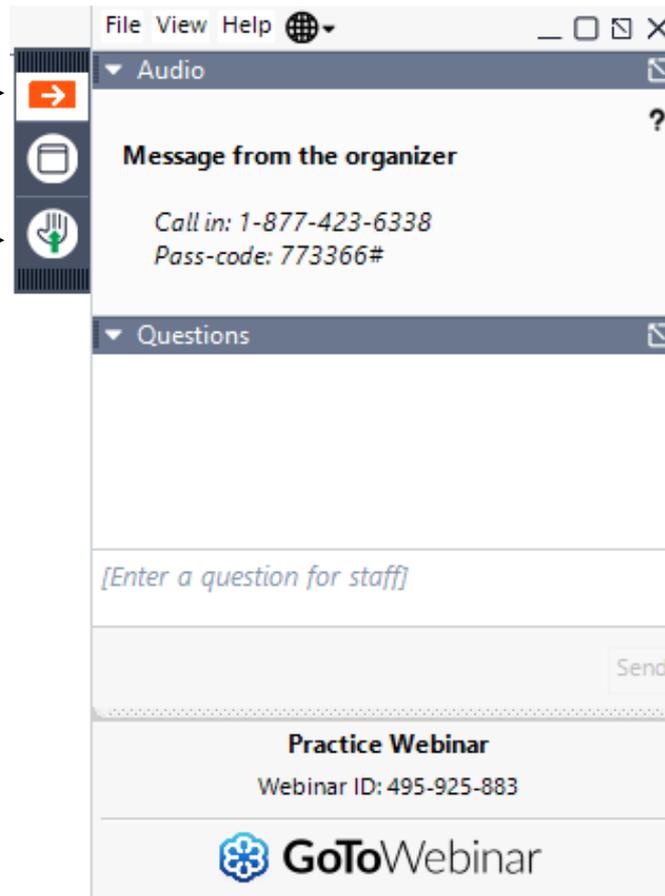
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ENERGY STAR Most Efficient

- 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 2020

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

Product Category	Models	ENERGY STAR Partners
Boilers	546	32
Ceiling Fans	184	14
Central Air Conditioners and Air Source Heat Pumps	195	10
Clothes Dryers	23	6
Clothes Washers	41	4
Compact Freezers	11	5
Compact Refrigerators	69	20
Computer Monitors	271	18
Dehumidifiers	3	3
Dishwashers	101	8
Freezers	3	1
Furnaces	141	7
Geothermal Heat Pumps	611	10
Refrigerators	466	38
Room Air Conditioners	10	2
Sliding Glass Doors	5	3
Televisions	6	5
Ventilating Fans	157	17
Windows	477	43
Total*	3,320	212



ENERGY STAR Most Efficient 2020

Update: Utility Collaboration

- Over 30 energy efficiency program sponsors are leveraging ENERGY STAR Most Efficient.
 - Serving over 8 million households (21 million consumers)
 - Featuring one or more Most Efficient product categories; includes 2 water utilities
- ENERGY STAR Most Efficient leveraged for retailer incentives through ENERGY STAR Retail Products Platform (ESRPP)
 - Innovative, nationally coordinated, market transformation initiative
 - ESRPP retailers now represent more than 75% of the appliance market, with more than 1,000 stores in current program sponsors' service areas. 16 efficiency program sponsors participate and serve more than 18% of U.S. households
 - 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

2020 Update: Consumer Education

- ENERGY STAR Most Efficient website:
 - Consumers frequently visit the ENERGY STAR Most Efficient web page in their search for the best products on the market. On average, more than 40,000 visit per month
 - Includes product images and real-time information on retail pricing and where to locate and buy these models
- More Consumer Education:
 - BobVila.com article with product giveaway
 - “3 Easy Ways Laundry Day Can Be More Efficient and Eco-Friendly”
 - Featured ENERGY STAR Most Efficient dryers and clothes washers- 1.8 million pageviews!
 - ENERGY STAR Most Efficient refrigerators were promoted through a press release and a soon-to-be published Ask the Experts @ENERGY STAR blog



National Awareness of ENERGY STAR for 2019: CEE Household Awareness Highlights

- 18th national survey/analysis
- Survey conducted by the Consortium for Energy Efficiency (CEE) – non profit, members include U.S and Canadian EE program administrators
- Awareness remains high! 91% aided recognition; 83% unaided recognition
- 20% of ENERGY STAR aware population are aware of ENERGY STAR Most Efficient
- 68% agree somewhat or strongly 'all things equal, I would buy a product because it is designated ENERGY STAR Most Efficient'
- https://www.energystar.gov/partner_resources/awareness



ENERGY STAR Most Efficient

Categories in 2021

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



Draft 2021 ENERGY STAR Most Efficient Recognition Criteria





Clothes Washers

- **2021 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
 - Minimum cleaning performance level of ≥ 85
 - Expand scope to include laundry centers if they meet the ENERGY STAR Most Efficient criteria for washers and dryers
- **Rationale:**
 - Recognizes ~19 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
 - The ENERGY STAR Retail Products Platform (ESRPP) currently incentivizes washers at this level for their advanced tier.



Clothes Dryers



- **2021 Proposal:**
 - Maintain current criteria for all dryer product types
 - There are 17 base models from 7 brands (Asko, Beko, Blomberg, LG, Miele, Samsung, Whirlpool) that meet the max dry cycle criteria
 - The criteria includes one level when tested per the DOE test method for certification and another level when tested per the DOE test method in normal cycle with max dryness setting selected

Cycle Setting	Product Type	CEF _{BASE} (lbs/kWh)
Normal	Compact Ventless Electric (240V)	≥ 3.7
	Electric (all other)	≥ 4.30
	Gas	≥ 3.80
Normal, Maximum Dryness	Compact Ventless Electric (240V)	≥ 2.68
	Electric (all other)	≥ 3.93
	Gas	≥ 3.48



Clothes Dryers

- **Rationale:**

- The number of dryers on the 2020 Most Efficient list with the max dry criteria grew by one model for the year
 - There are 17 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 2021 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
- The ESRPP currently incentivizes dryers at this level for their advanced tier.



Refrigerators



- **2021 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
- **Rationale:**
 - There are 193 base models from 53 brands meet the criteria
 - Levels for top freezers remained the same for 2020
 - Top Freezers remain the lowest energy-consuming standard-size refrigerator-freezer product type
 - Levels for Side-by-Sides and Bottom Freezers were raised in 2020
 - Optional reporting of refrigerant type in response to requests from multiple utilities
 - The ESRPP currently incentivizes refrigerators at this level for their advanced tier



Freezers

- **2021 Proposal:**
 - Maintain criteria for standard-size Upright Freezer and Chest Freezer product types
 - $\geq 15\%$ more efficient than the Federal minimum
- **Rationale:**
 - There are 29 Upright Freezer and Chest Freezer base models from 8 brands that meet the criteria.
 - Optional reporting of refrigerant type in response to requests from multiple utilities
 - The ESRPP currently incentivizes freezers at this level within their advanced tier.





Compact Refrigerators and Freezers

- **2021 Proposal:**
 - Maintain criteria for compact Refrigerator, Refrigerator-Freezer, and Freezer product types
 - $\geq 25\%$ more efficient than the Federal minimum for compact Refrigerators and Refrigerator-Freezers
 - $\geq 20\%$ more efficient than the Federal minimum for compact Freezers
- **Rationale:**
 - There are 35 compact Refrigerator and Refrigerator-Freezer base models from 11 brands that currently meet the criteria
 - There are 10 compact Freezer base models from 6 brands that meet the criteria
 - Optional reporting of refrigerant type in response to requests from multiple utilities
 - The ESRPP currently incentivizes compact refrigerators at this level for their advanced tier.



Room Air Conditioners

- **2021 Proposal:**

- Maintain current criteria for Room Air Conditioner (RAC) 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
 - Optional reporting for refrigerant type
 - Currently 7 models from 2 brands (LG and Midea) meet the criteria

- **Rationale:**

- RACs were a new ESME product category for 2020 after 2 years as ETA product; a few, but growing number of models meet Most Efficient criteria
 - The ESRPP currently incentivizes RACs at this level for their advanced tier



Dehumidifiers



- **2021 Proposal:**
 - Maintain 2020 criteria for portable dehumidifiers:
 - >19% more efficient than DOE minimum.
 - Maintain 2020 criteria for whole-home dehumidifiers:
 - >25% more efficient than DOE minimum.
- **Rationale:**
 - EPA estimates that 5 models representing 4 brands currently meet the criteria.
 - Criteria continue to recognize the most efficient models available on the market.



Dishwashers



- Most Efficient Criteria for Dishwashers 2021 are under development
- The ENERGY STAR specification for Dishwashers is currently under revision; EPA is delaying release of ENERGY STAR Most Efficient 2021 criteria until the revision process is more complete
- EPA will release a proposal for stakeholder review and comment



Ceiling Fans

- **2021 Proposal:** Maintain levels – while a high portion of the ENERGY STAR QPL meets ESME, a very low portion of the market meets ENERGY STAR
- Current Levels:
 - 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
 - $\geq 4.58D + 0.02$



Ceiling Fans



- **Rationale:**
 - Standard & hugger fan criteria is still very stringent as the DOE minimum is set very close to max tech:
 - 196 Models ENERGY STAR certified, 168 meet ESME
 - But ESME exclusive compared to CCMS listings
 - DOE minimum efficiency is at their highest technologically feasible level, so ESME proposal set at 10% energy savings.
 - Current specification effective June 2018, so 2021 specification review and possible revision; if revised ESME 2022 criteria update needed
 - 2021 review will yield extensive market information to support ESME 2022 update whether we revise or not



Ceiling Fans



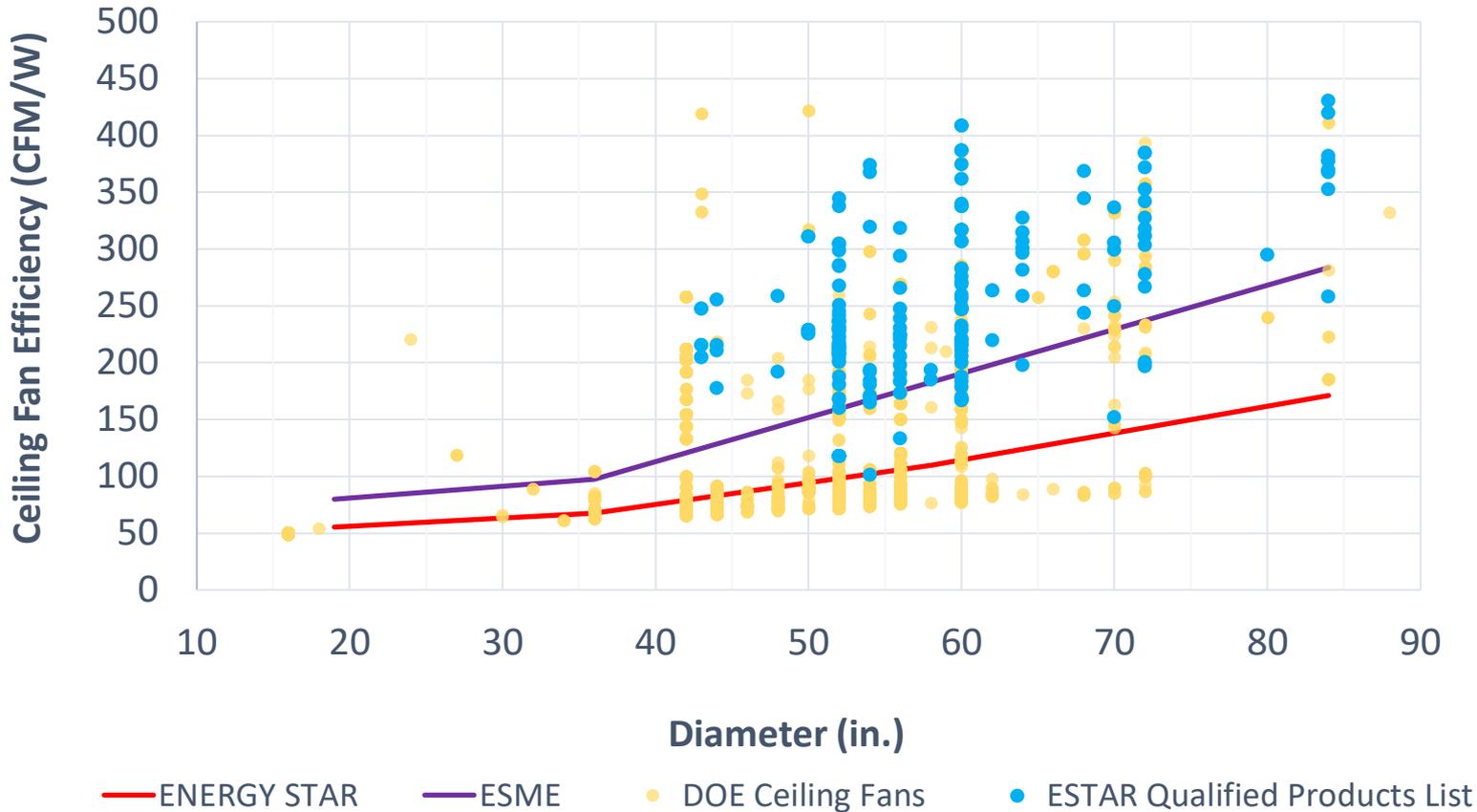
System Type	% ESME/ QPL	% Listed ESME / DOE CCMS	Per Unit Savings
Ceiling Fan Only	79%	-	64%
Ceiling Fan with Light Kit	89%	-	64%
Total	85%	5%	64%



Ceiling Fans



All Listed Ceiling Fan Products



Reminder: subset of models classified as HSSD but sold to consumers indistinguishably have higher DOE standard; all meet E and ESME criteria



Ventilating Fans



- **2021 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 at high speed (cfm/W): ≥ 5
- $6 \leq \text{MERV} < 13$ - Efficacy at high speed (cfm/W): ≥ 4.7
- $\text{MERV} \geq 13$ - Efficacy at high speed (cfm/W): ≥ 3.8

13% of QPL meets ESME



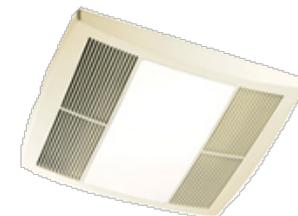
Ventilating Fans



- **Rationale:**
 - Added sound criteria in 2019 for B/U products: many B/U fans meet Efficacy criteria and have not submitted data for Sound Level at 0.25 in. w.g.
 - Efficacy levels for inline fans still significant hurdle.
 - High efficiency range hood market is still limited – only two manufacturers with efficacy above 5.0 cfm/W
 - Capture efficiency test not yet published, but may be used for differentiation in the future



Ventilating Fans

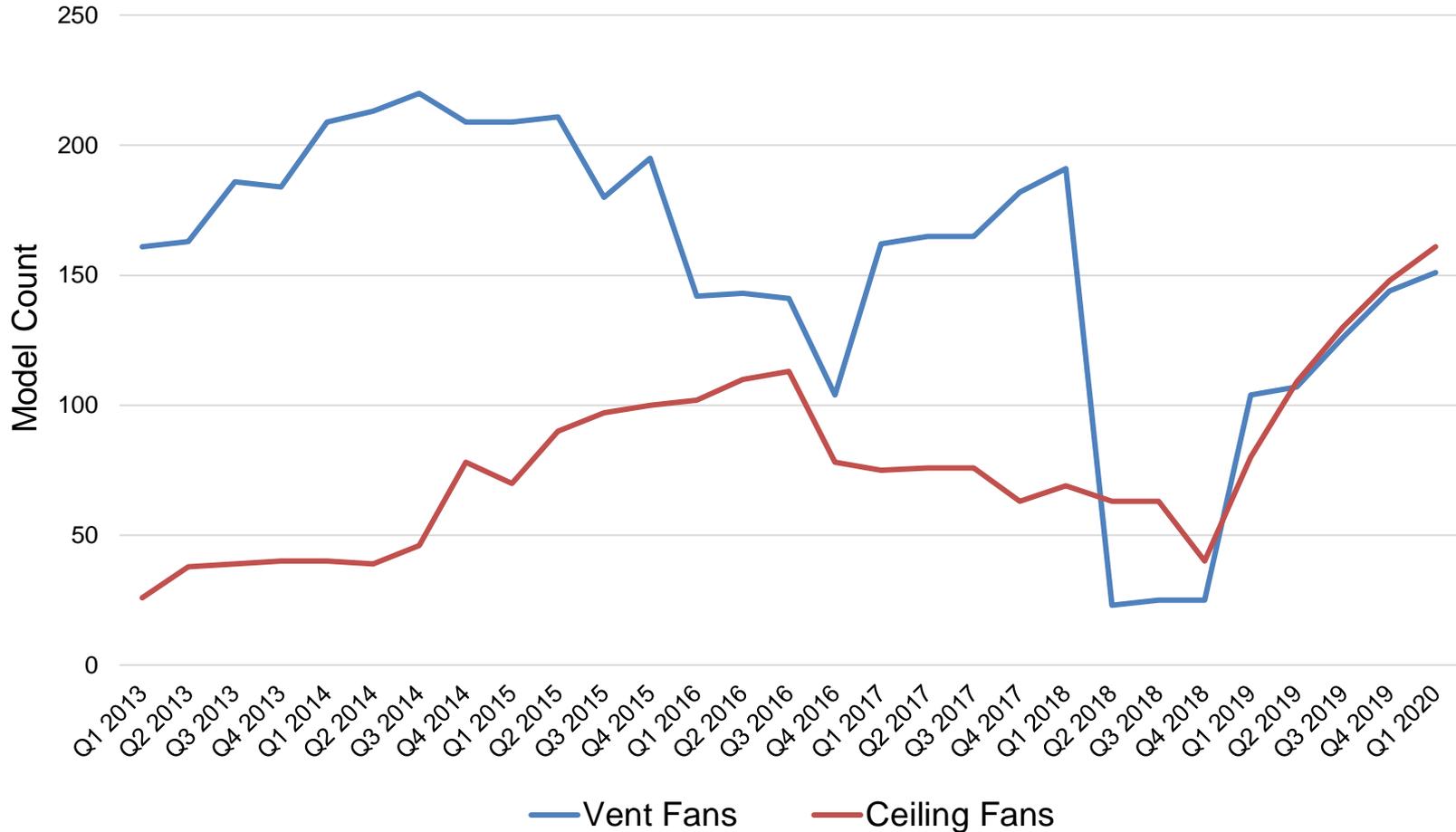


System Type	% ESME/ QPL	% Listed ESME / Listed HVI	Per Unit Savings
Bathroom/Utility room fans	13%	2.4%	86%
Inline – Single Port	51%	4.7%	44%
Inline – Multi Port	25%	18.9%	44%
Total	13%	1.2%	



Ceiling and Ventilating Fans

ESME Vent Fans and Ceiling 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 that they meet system status and messaging criteria.
- Most must also meet staged or variable capacity criterion.
- Application process unchanged in 2021.



System Status and Messaging Criteria

- **2021 Proposal:** Maintain system status and messaging criteria
 - Unit Setup Information
 - Fault History
 - Resident Alerts in Plain Text

Variable capacity

- **2021 Proposal:** Maintain 2020 criterion
 - Provide heating and cooling at two or more capacity levels
 - Water-to-water GHP are exempt



CAC-HP ESME Criteria

ENERGY STAR CAC-HP Version 6.0 will be effective 1/1/2023:

- In 2022-2023, EPA will align the ESME Unit Setup requirements with the Installation Criteria, and raise the efficiency metric levels as needed to differentiate from the Version 6.0 specification
- ESME could look very different, depending on:
 - How will the market change in response to the 2023 DOE minimum efficiencies and Appendix M1?
 - How will variable speed communicating thermostats be recognized?

EPA proposes not changing criteria for 2021, so that the ESME products will only need to meet revised criteria once –at a time before the 2023 effective date.



Centrally Ducted Air Conditioners and Heat Pumps



- **2021 Proposal:** Not changing in 2021, with assumption it will change in 2022-2023
- **Rationale:**
 - Current criteria continue to recognize a select group of extremely efficient products with features facilitating quality installation and maintenance
 - Current ESME is significantly less than 1% of all AHRI listings, but we anticipate the metric criteria will be met by a larger share of units by 2023
 - Additionally will want to align with Version 6.0 Installation criteria



Centrally Ducted Air Conditioners and Heat Pumps

System Type	% Meet ESME level from AHRI	% Listed ESME/AHRI
Split AC	1.7%	0.038%
Packaged AC	14.8%	
Split HP	1.5%	0.133%
Packaged HP	11.1%	
Total	1.7%	0.052%



Ductless Split Air Conditioners and Heat Pumps



- **2021 Proposal:** Maintain current performance, may need to differentiate for 2022-2023
 - 20 SEER; 12.5 EER; 10 HSPF (HSPF for heat pumps only)
- **Rationale:**
 - While rated performance requirements are not exclusive, the system status and messaging criteria are:
 - 0.9% of AC models and 1.6% of HP models are recognized among those in AHRI directory within scope



Ductless Split Air Conditioners and Heat Pumps



System Type	% Meet ESME level from AHRI	% Listed ESME/AHRI
Ductless AC	20%	0.9%
Ductless HP	32%	1.1%
Total	30%	1.0%



Savings for Air Conditioners and Heat Pumps

System Type	SEER	EER	HSPF	Savings (North)	Savings (South)
Split AC	18.0	13.0	-	28%	22%
Split ASHP	18.0	12.5	9.6	19%	19%
Packaged AC	16.0	12.0	-	13%	13%
Packaged ASHP	16.0	12.0	8.2	8%	8%
Ductless AC	20.0	12.5	-	35%	30%
Ductless HP	20.0	12.5	10.0	25%	25%



Furnaces

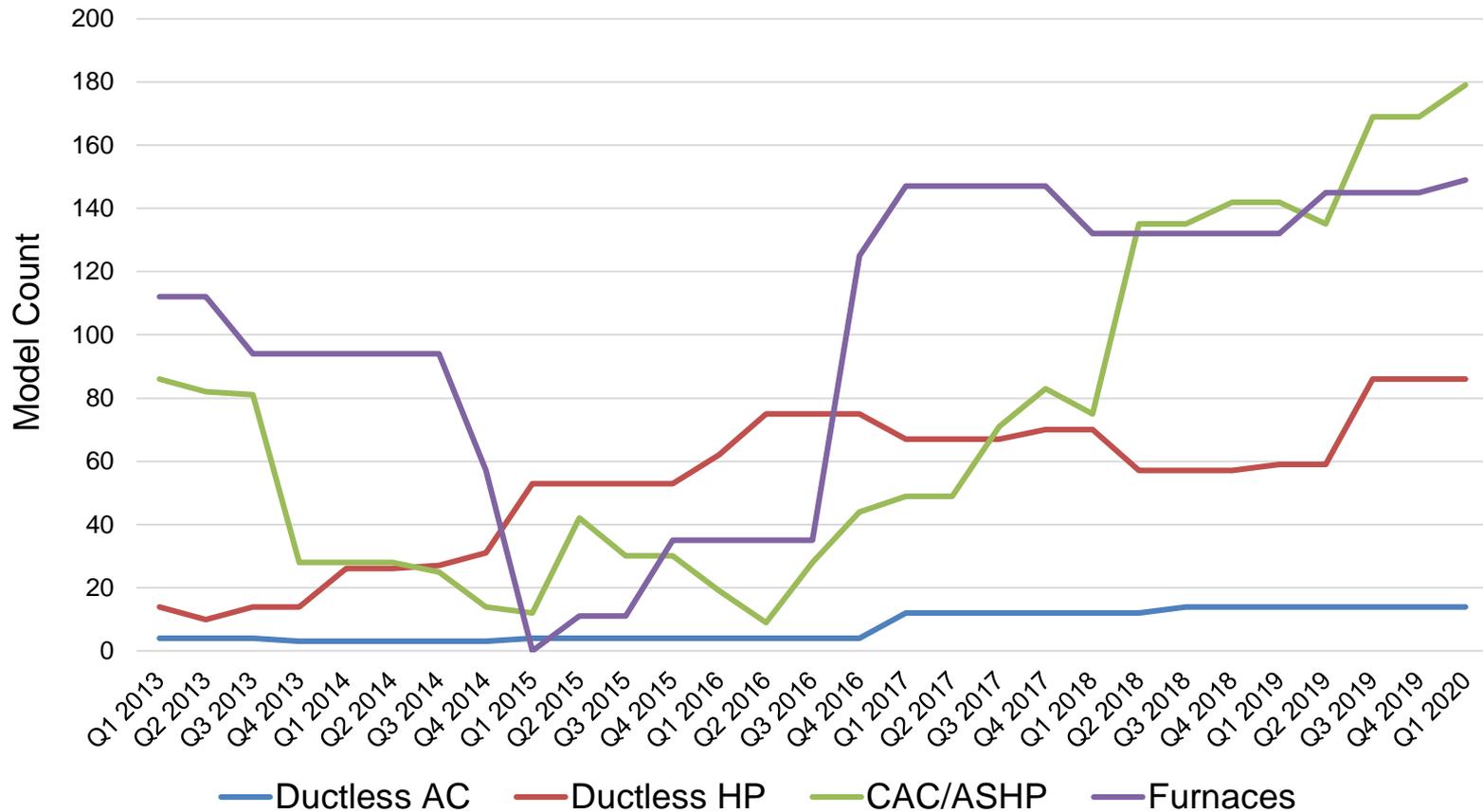
- **2021 Proposal:** Maintain current performance and system status and messaging criteria
 - ≥ 97 AFUE
- **Rationale:**
 - AFUE requirement alone offers great differentiation of products and is aligned with CEE Tier 3
 - No technical difference between 97 and 98 AFUE
 - 3% of QPL is ESME

System Type	% Meet ESME level from AHRI	% Listed ESME/ AHRI	Per Unit Savings
Gas	4.7%	1.9%	22%



AC, Heat Pumps, & Furnaces

ESME Heating and Cooling Products





Geothermal Heat Pumps

- **2021 Proposal:** Maintain current performance, system status and messaging, and two capacity criteria;
 - Add DGX-to-water category

- **Rationale:**
 - Current criteria continue to recognize a select group of extremely efficient products with features facilitating quality installation and maintenance
 - Percent of products recognized is appropriate:

System Type	% Listed ESME/ EStar	% Listed ESME/ AHRI
GHP	5.9%	3.8%



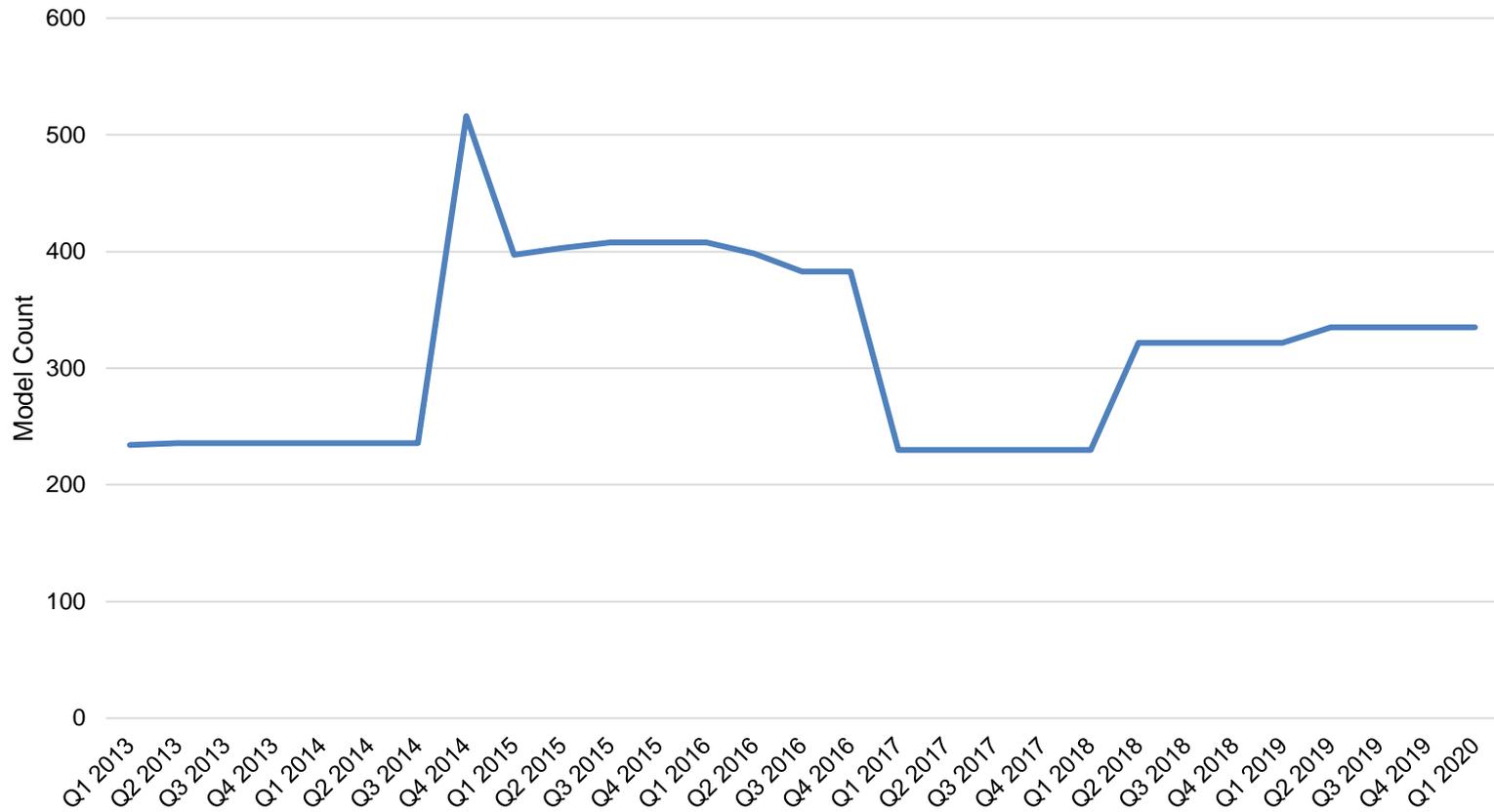
Geothermal Heat Pumps

System Type	EER	COP	Savings
Closed Loop Water-to-Air GHP	17.1	3.6	31%
Open Loop Water-to-Air GHP	21.1	4.1	17%
Closed Loop Water-to-Water GHP	16.1	3.1	37%
Open Loop Water-to-Water GHP	20.1	3.5	25%
DGX-to-air	16.0	3.6	22%
DGX-to-water	15.0	3.1	14%



Geothermal Heat Pumps

ESME GHPs





Boilers



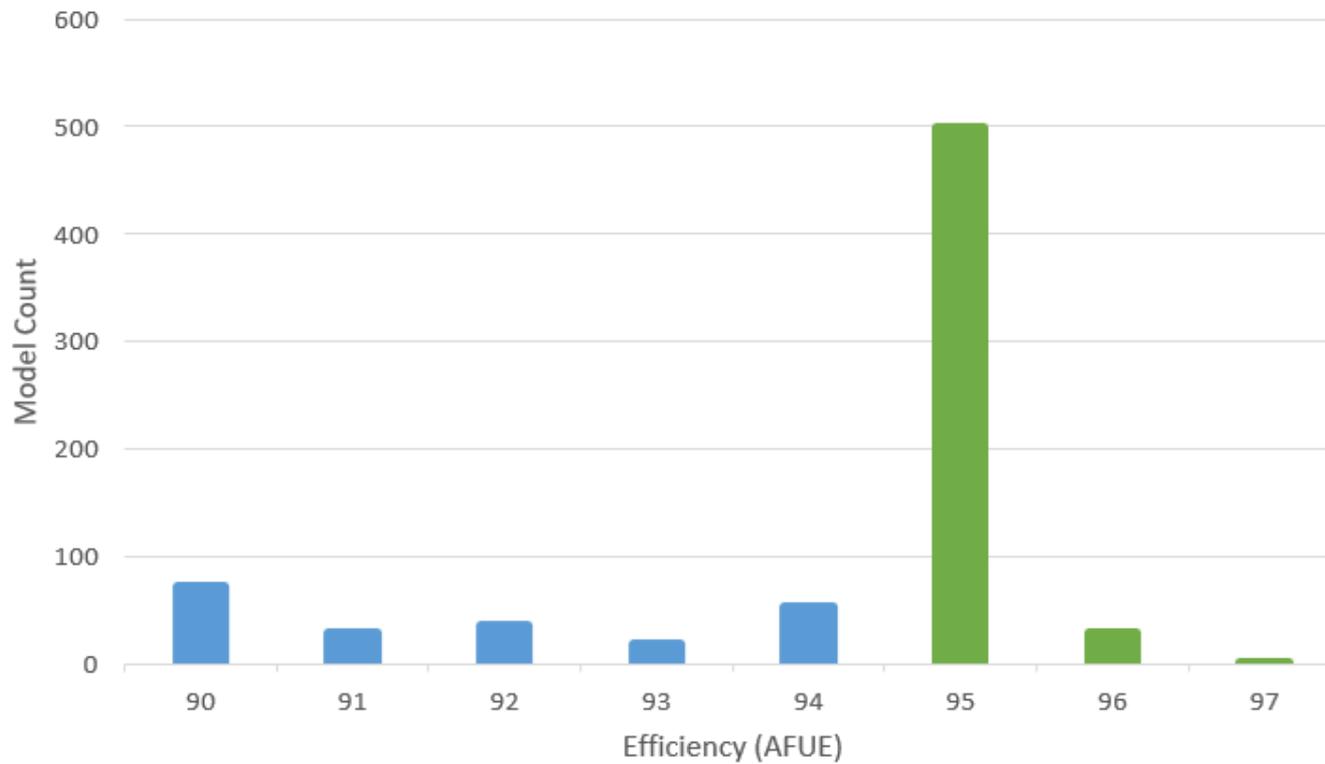
- **2020 Proposal:**
 - Pause recognition as ESME until additional efficiency distinctions arise
- **Rationale:**
 - A large percentage of available boiler products meet current criteria – 38% of gas products listed on the DOE CCMS
 - As in the past several years, we have been unable to find opportunities for additional distinctions
 - No technical difference between 95 and 96 AFUE
 - Potential for better installed efficiency with Indoor Temperature reset, combustion controls, or installation & maintenance criteria
 - Some of these technologies are available for commercial boilers but not for residential boilers



Boilers



ENERGY STAR Boiler Distribution

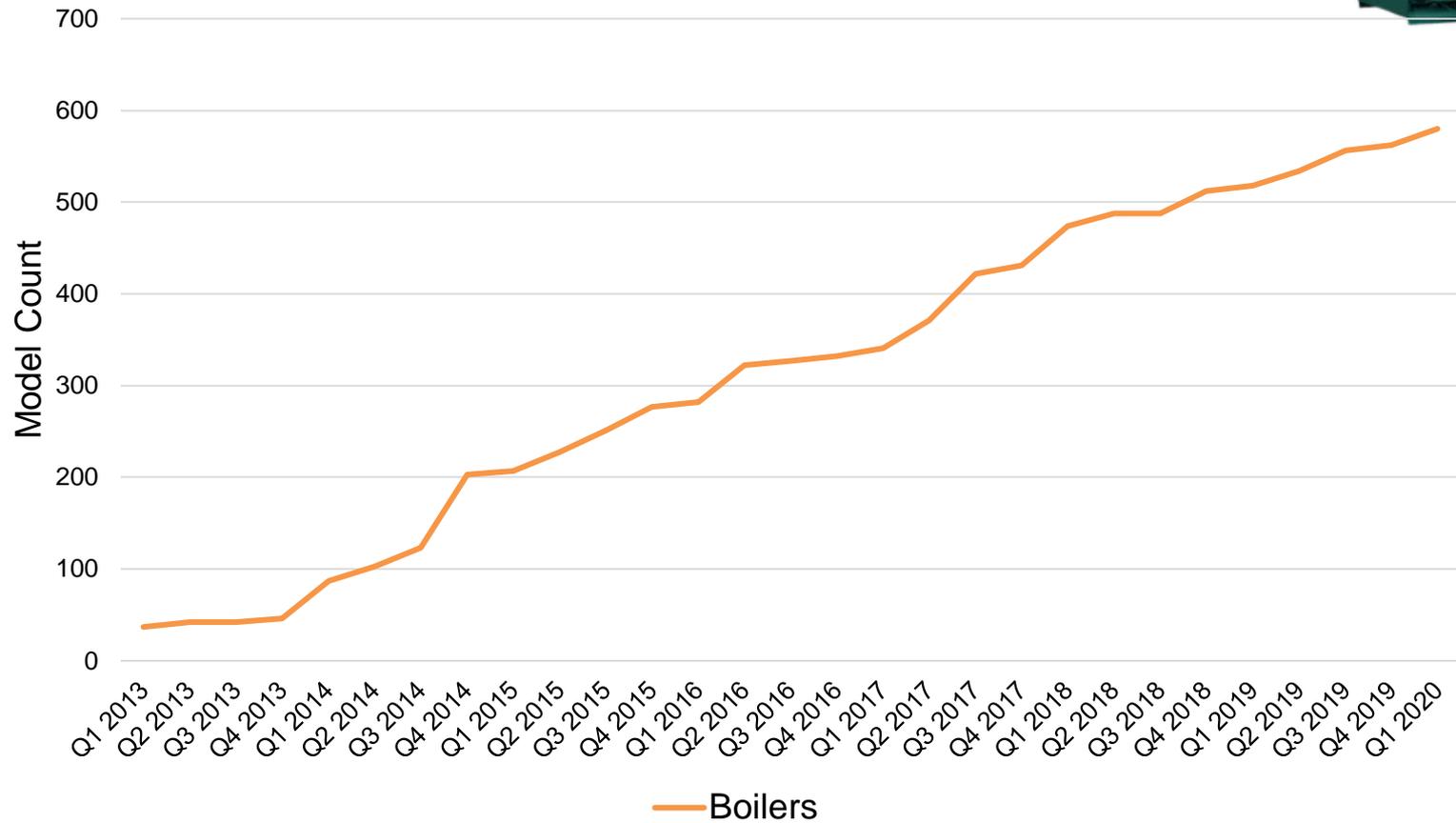




Boilers



ESME Boilers





Computer Monitors



2021 Proposal: Maintain 2020 criteria

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:**

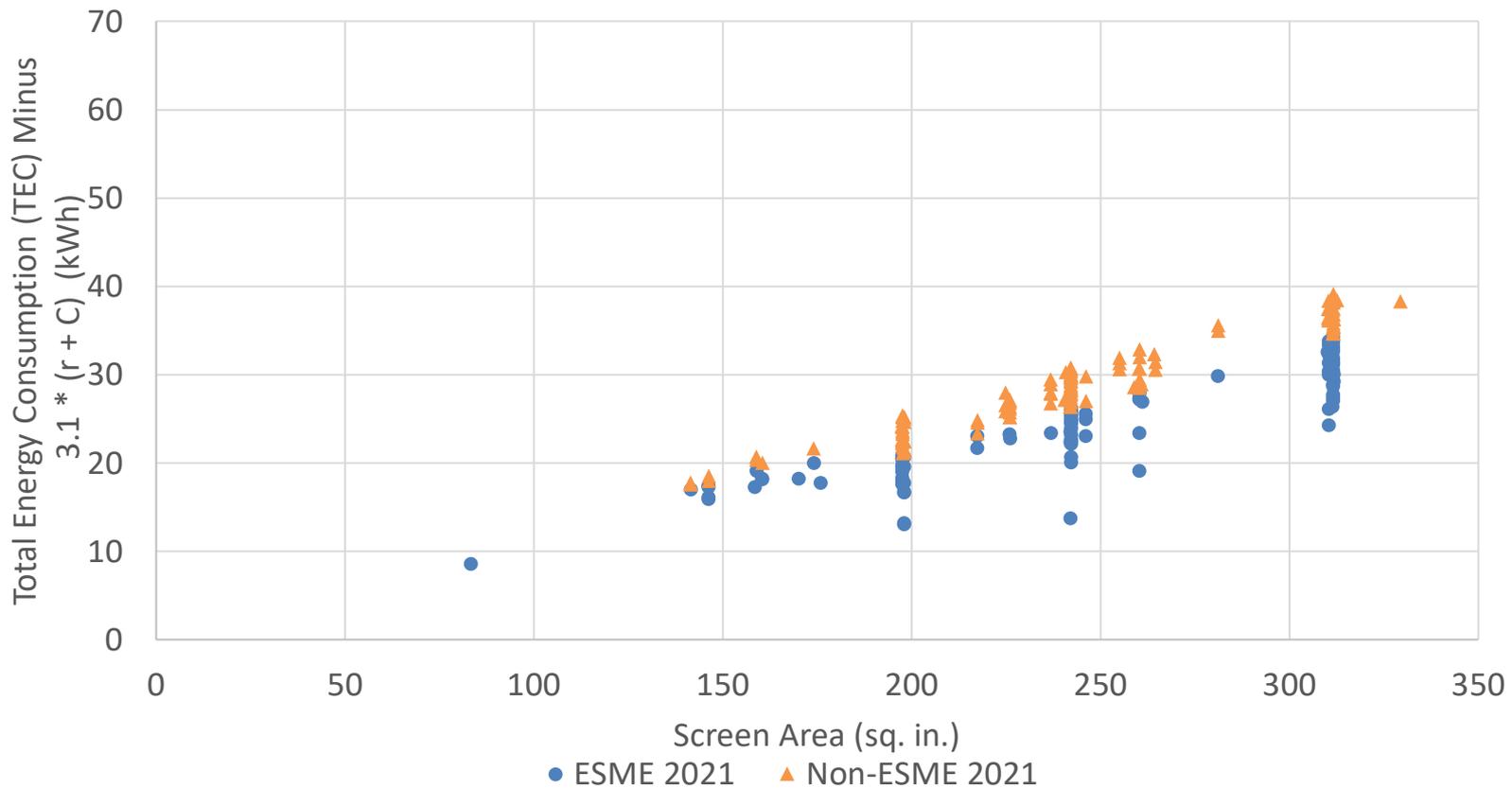
- EPA revised the recognition criteria in 2020 and is proposing to maintain those levels in 2021.
- Based on participation in ENERGY STAR Most Efficient 2020, the current criteria are serving as a high-performance benchmark.
- The savings potential for more stringent criteria is minimal; more differentiation is expected in 2022.

Area	Estimated Total Market (# of monitors per 2019 ES QPL)	# Monitors in Current ES QPL	# Monitors Meeting ESME 2021	% of Total Market Meeting ESME 2021
< 180 sq. in.	131	56	21	16%
180 - 220 sq. in.	195	85	48	25%
> 220 sq. in.	676	371	183	27%
All	1002	512	252	25%



Computer Monitors

TEC minus $3.1 * (r + C)$ of 2021 ESME Products





Televisions



- Most Efficient Criteria for Televisions 2021 are under development.
- The ENERGY STAR specification for Televisions is currently under revision; EPA is delaying release of ENERGY STAR Most Efficient 2021 criteria until the revision process is more complete.
- EPA will release a proposal for stakeholder review and comment.

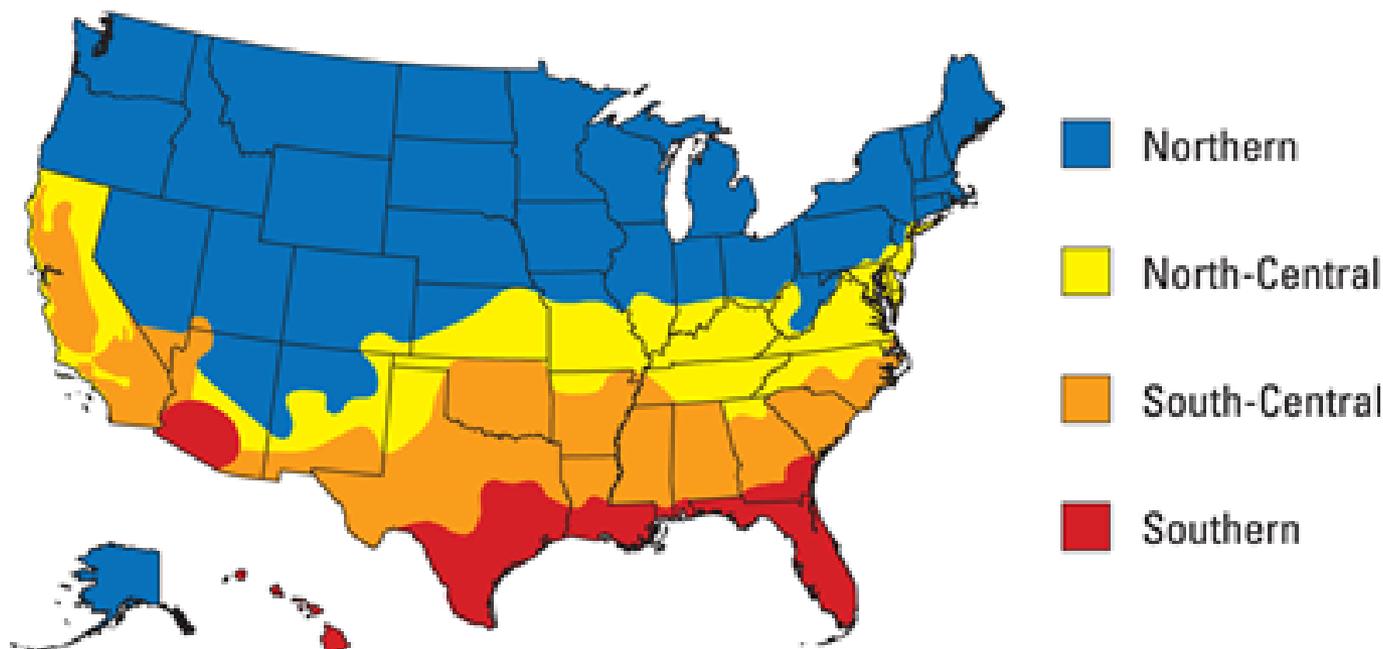


Residential Windows and Sliding Glass Doors

- **2021 Proposal:**
 - Maintain current U-factor and SHGC criteria (No change)
 - Residential window and sliding glass door products only (No swinging doors, skylights, or TDDs)
 - Meaningful savings and improved comfort
 - Verification testing required!
- **Rationale:**
 - High Performance ME window products are widely available; but still a relatively small slice of total market
 - 45 manufacturers
 - 475 ME product lines
 - 5 new ME sliding glass door product lines
- **Future:**
 - EPA is doing analysis to see if an ENERGY STAR criteria revision is possible. This may impact ES ME window criteria and/or climate zones in the future.

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

- Comments are due August 7; send to MostEfficient@energystar.gov
- Slides will be posted to: https://www.energystar.gov/products/spec/energy_star_most_efficient_2021_criteria_development_pd
- The 2021 criteria will be finalized in August 2020
- Products will be recognized as ENERGY STAR Most Efficient 2021 beginning January 1, 2021



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Thank you for your participation today.