



ENERGY STAR® Most Efficient 2015 Update and 2016 Criteria

August 25, 2015



Webinar Logistics

- Audio provided via teleconference:
Call in: +1 (877) 423-6338 (U.S.)
Code: 316317
- Press *6 to mute or un-mute your line



ENERGY STAR Most Efficient

- An extension of the **trusted** ENERGY STAR brand
- Recognizing the **most efficient** products among those that qualify for the 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 Most Efficient is awarded to only the top performers



ENERGY STAR Most Efficient Categories in 2016

- Boilers
- Ceiling and Ventilating Fans
- CAC/ASHP
- Clothes Washers
- Computer Monitors
- Dishwashers
- Furnaces
- Geothermal Heat Pumps
- Refrigerator- Freezers
- Televisions
- Windows





ENERGY STAR Most Efficient 2015 Update: Growing Recognized Products

Product Category	Models	ENERGY STAR Partners
Boilers	230	27
Ceiling Fans	89	13
Central Air Conditioners and Air Source Heat Pumps	75	9
Clothes Washers	35	7
Computer Monitors	73	22
Dishwashers	6	2
Furnaces	11	1
Geothermal Heat Pumps	406	9
Refrigerators-Freezers	17	6
Televisions	122	19
Ventilating Fans	211	11
Windows	446	46
Total	1721	108



ENERGY STAR Most Efficient 2015 Update: Growing Utility Collaboration

- Utility efficiency program sponsors: 15 in 2014 to over 40 in 2015
 - Partners serve approximately 26 million residential customers, or nearly 70 million consumers
 - 10 more program sponsors expressed interest in leveraging ENERGY STAR Most Efficient
- Spot marketing to raise awareness and build demand of ENERGY STAR Most Efficient among target consumers
 - In 2014, spot marketing in Albany, NY and Sacramento, CA. Online and radio ads focused on the benefits of ENERGY STAR Most Efficient products. Banner placements in online publications (HGTV, The New York Times, and Forbes). 12 million impressions in 2014.
- Enhancing the functionality of the ENERGY STAR Most Efficient website, adding price and locator information. Pilot with refrigerators and clothes washers, extending to all products sold at retail
- The ENERGY STAR Most Efficient website is among the top 20 most frequently visited ENERGY STAR pages with over 17,000 visits/mo

ENERGY STAR. The simple choice for energy efficiency.



2015 ENERGY STAR Most Efficient Promotion

- September – October 2015
- OwnerIQ Banner Placements
- energystar.gov/moste efficient landing page with targeted pop-ups for select cities/regions
- Performance data to be tracked: impressions, clicks, visits to landing page (via Google Analytics)
- Online ads supported by in-store partner signage highlighting rebate opportunities
- Signage sized and approved for use by ENERGY STAR retail partners: Sears, Best Buy, and The Home Depot
- PDF templates customizable to incorporate partner logo and incentive information





Draft 2016 ENERGY STAR Most Efficient Recognition Criteria





Clothes Washers

- **2016 Proposal:**
 - Remove references to V 6.1
 - Modest adjustment to criteria for standard size (>2.5 cu.ft) washers:

IMEF	IWF
≥ 2.76	≤ 3.2

- Top- and front-load clothes washers are subject to the same criteria
- Continue to exclude small volume (1.6-2.5 cu-ft) washers



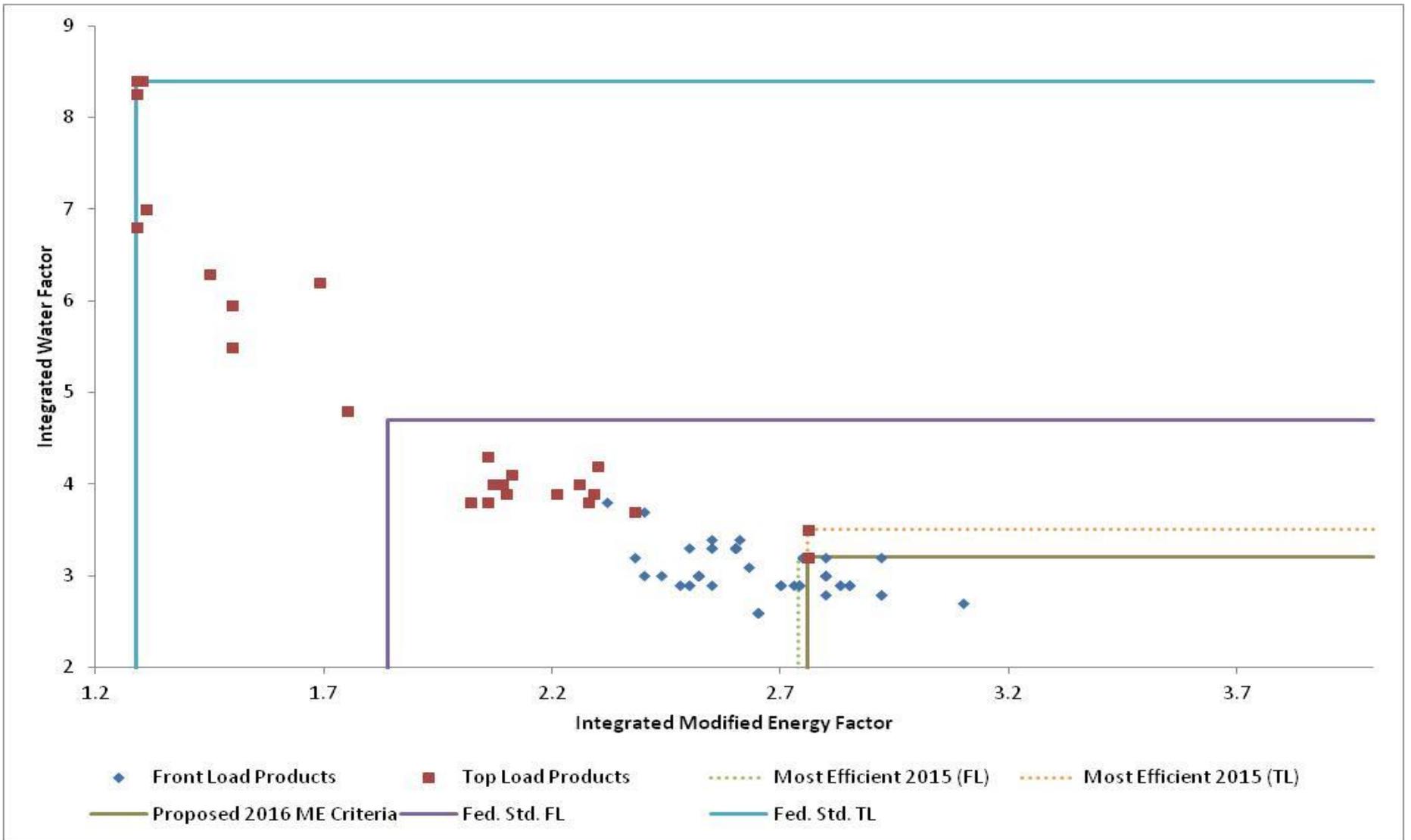


Clothes Washers

- **Rationale:**
 - Consistent with original intent to recognize top performers regardless of configuration
 - Recognizes about 18 front and top-load standard washer models in a range of sizes (3.7-5.6 cu-ft)
 - Significant energy and water savings: 33% less energy and 32% less water than a product meeting the 2015 federal standard (based on a front load model)
 - Not enough differentiation in the market for small volume products at this time
- Products that meet proposed requirements are available from 4 partners and offered under 4 brands (GE, Kenmore, LG, Samsung)



Clothes Washers





Dishwashers



- **2016 Proposal:**
 - Maintain current criteria
 - Standard Dishwashers included
 - Annual Energy Use ≤ 240 kWh/yr; Water Use ≤ 3.2 Gallons/cycle
 - Minimum per cycle Cleaning Index of 70, for heavy, medium and low cycles, as assessed under the ENERGY STAR Test Method for Determining Residential Dishwasher Cleaning Performance (Rev. Feb-2014)
 - Submit at the time of certification
 - Average cleaning index for all units in the sample
 - Not subject to verification testing

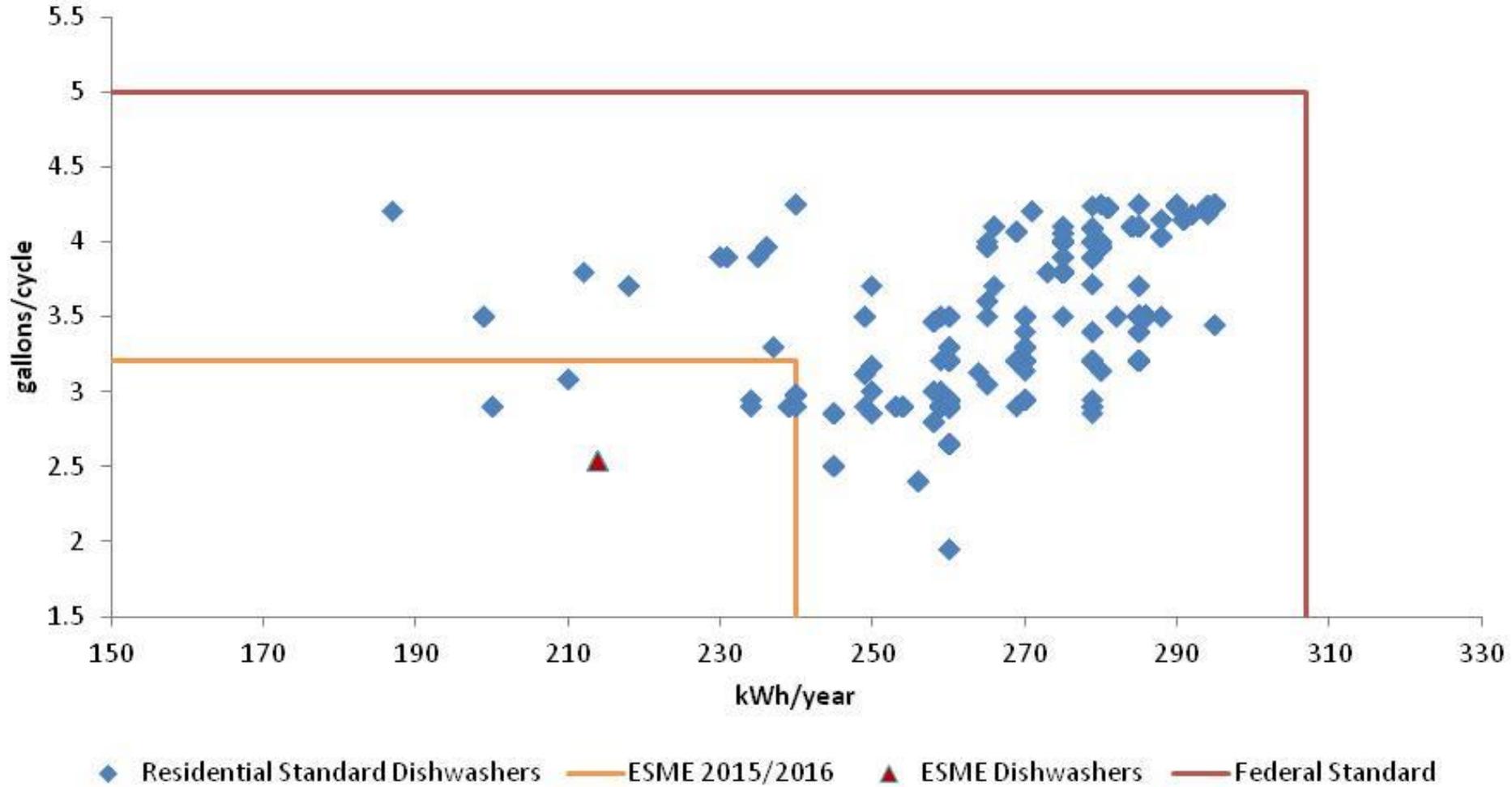


Dishwashers

- **Rationale:**
 - New product category introduced under 2015 ENERGY STAR Most Efficient
 - Currently 6 models from 2 brands (Blomberg, Viking) are on our Most Efficient list – meaning they have met the energy, water and cleaning criteria
 - Represents small percentage of products on the QPL
 - About 30 models (5% of the QPL) from 6 brands meet the energy and water criteria
 - EPA does not have info on whether they would meet the cleaning criteria
 - EPA encourages partners to submit cleaning data
 - A dishwasher meeting the ENERGY STAR Most Efficient 2016 proposal saves 22% energy and 36% water compared to the federal minimum



Dishwashers





Refrigerators



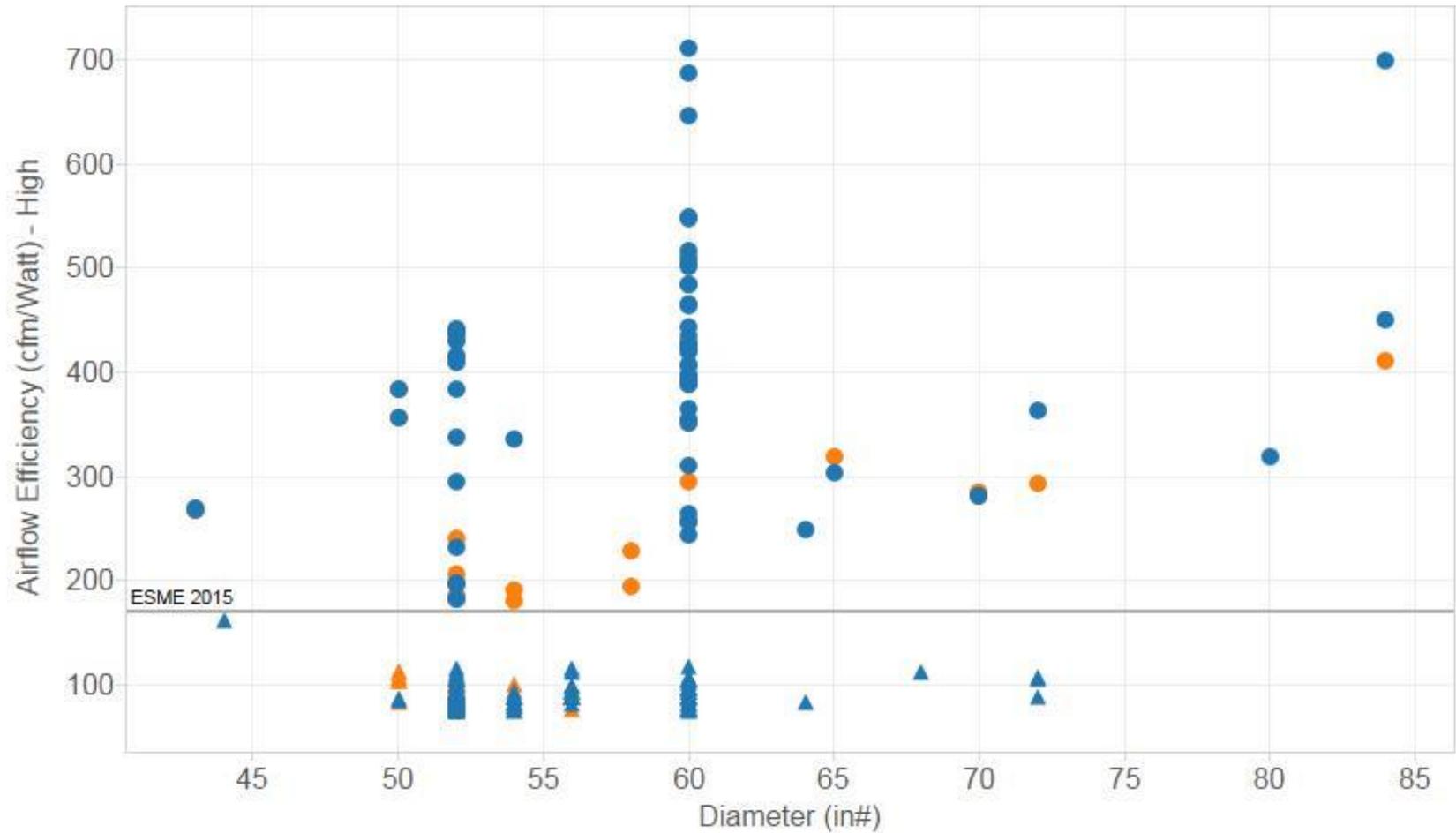
- **2016 Proposal:**
 - Maintain current criteria
- **Rationale:**
 - Energy savings of ~15%+ relative to a model just meeting the 2014 federal minimum
 - Watching for ENERGY STAR and ENERGY STAR Most Efficient lists to repopulate after fall 2014 transition
- Products that meet the criteria so far:
 - Come in a range of sizes (11.4-28 cu-ft)
 - Being promoted by 4 manufacturing partners –Samsung, Fischer & Paykel, Liebherr, and Bosch



Ceiling Fans

- **2016 Proposal:** Maintain current criteria
 - Efficiency (cfm/W): ≥ 170 at high speed, ≥ 270 at medium speed, ≥ 400 at low speed
- **Rationale:**
 - ENERGY STAR Most Efficient continues to represent an exclusive group of models
 - Further, current criteria continues to distinguish a group of models with characteristically better performance based on DC brushless motors
 - Savings remain compelling, with ENERGY STAR Most Efficient ceiling fans using 1/3 the power (fan and lighting) of conventional fans
- DOE rulemaking for first minimum efficiency standards for ceiling fans underway. EPA will continue to watch market and look for opportunities to increase stringency of ENERGY STAR Most Efficient criteria in coming years

Ceiling Fans (data source: ENERGY STAR certified products)



ESME 2015
▲ No
● Yes

Product Type
■ Ceiling Fan Only
■ Ceiling Fan with Light Kit

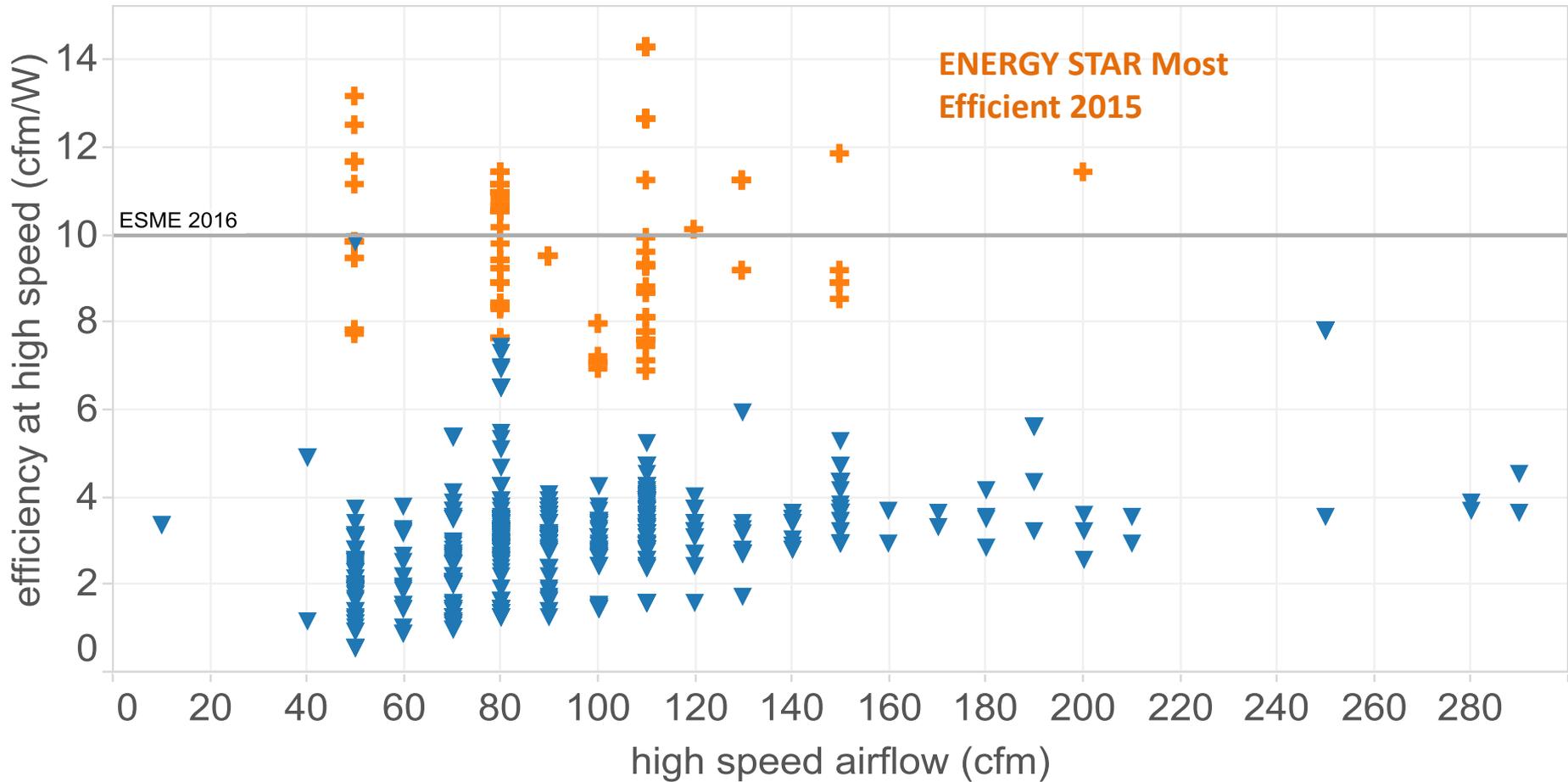
Ventilating Fans

- **2016 Proposal:**
 - Increase fan efficiency requirements for bath fans to maintain the exclusivity of the recognition and further encourage energy savings
 - Efficacy at high speed (cfm/W): ≥ 10 .
- **Rationale**
 - ENERGY STAR Ventilating Fan Specification V4.0 will be effective October 2015
 - Approximately 17% of models listed on the HVI directory meet the ENERGY STAR Most Efficient 2015 requirements (25-30% of ENERGY STAR models; would be even larger after new spec takes effect)
 - Raising fan efficiency requirement to 10 cfm/W at highest speed for all airflow rates reduces that to 7%
 - All airflow rates currently represented in ENERGY STAR Most Efficient remain represented
 - Airflow savings with new requirement around 85%, lighting savings 70%
 - No indication of new, highly efficient technologies for range hoods or in line fans at this time





Ventilating Fans





System Status and Messaging Criteria

- **2016 Proposal:** Maintain current criteria
- **Rationale:**
 - These criteria, in addition to the applicable efficiency criteria, continue to distinguish leaders among HVAC products
 - Fault history on alphanumeric display (on unit, thermostat, diagnostic tool, etc.)
 - Messages to residents in plain text, at least filter check and need for technician service; on thermostat or equivalent
 - Automatic setup requirement
 - Manufacturers responded robustly to new requirements implemented in 2015
- In 2016, similar requirements will be implemented for ductless split products (as applicable)

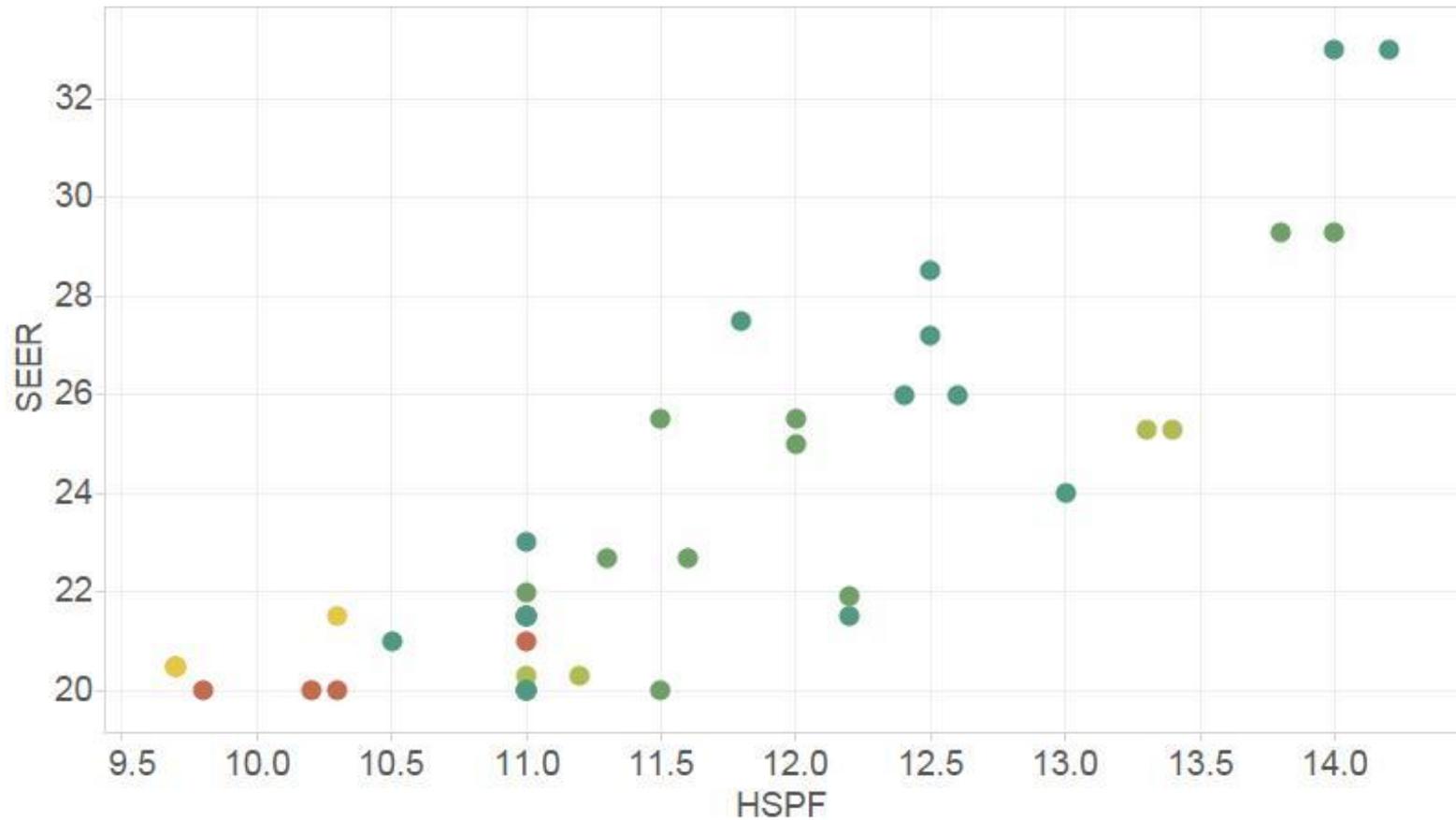


Ductless Split Air Conditioners and Heat Pumps

- **2016 Proposal:**
 - Apply system status and messaging requirements to the category
 - Increase HSPF slightly to align with Northern Climate Heat Pump specification requirement for single zone models
 - 20 SEER, 12.5 EER and (for heat pumps) 10 HSPF
- **Rationale:**
 - Ductless heat pumps continue to have strong and growing participation in ENERGY STAR Most Efficient.
 - 13% of ductless heat pump models in the AHRI directory meet SEER, EER and this new HSPF requirement, though not all will be recognized due to addition of system status and messaging requirements
 - 4 products currently recognized will no longer be recognized, all on the larger end; however, there are 2 ton units that do meet the requirement (see plot on next slide)



Ductless Heat Pumps





Centrally Ducted Heat Pumps, Air Conditioners, and Furnaces

- **2016 Proposal:** Maintain current criteria
- **Rationale:**
 - Current criteria continue to recognize a select group of extremely efficient products with features facilitating quality installation and maintenance
 - Gas Furnaces: 97 AFUE
 - AC and heat pumps: see chart next slide
 - Percent of products recognized among those in the AHRI directory are appropriate:
 - Centrally ducted split and packaged air conditioners: much less than 1%
 - Furnaces: much less than 1%
 - Geothermal Heat Pumps: 5.9%
 - The somewhat higher proportion of GHPs reflects that GHPs as a category align well with intention of ENERGY STAR Most Efficient
- In addition, EPA will be examining the ENERGY STAR GHP category in detail and may possibly revise in 2016, perhaps giving rise to revised criteria for ENERGY STAR Most Efficient GHP for 2017



Centrally Ducted Heat Pumps, Air Conditioners, and Furnaces

Product type	SEER	EER	HSPF	COP
Split AC	18	13		
Split HP	18	12.5	9.6	
Packaged AC	16	12.0		
Packaged HP	16	12.0	8.2	
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



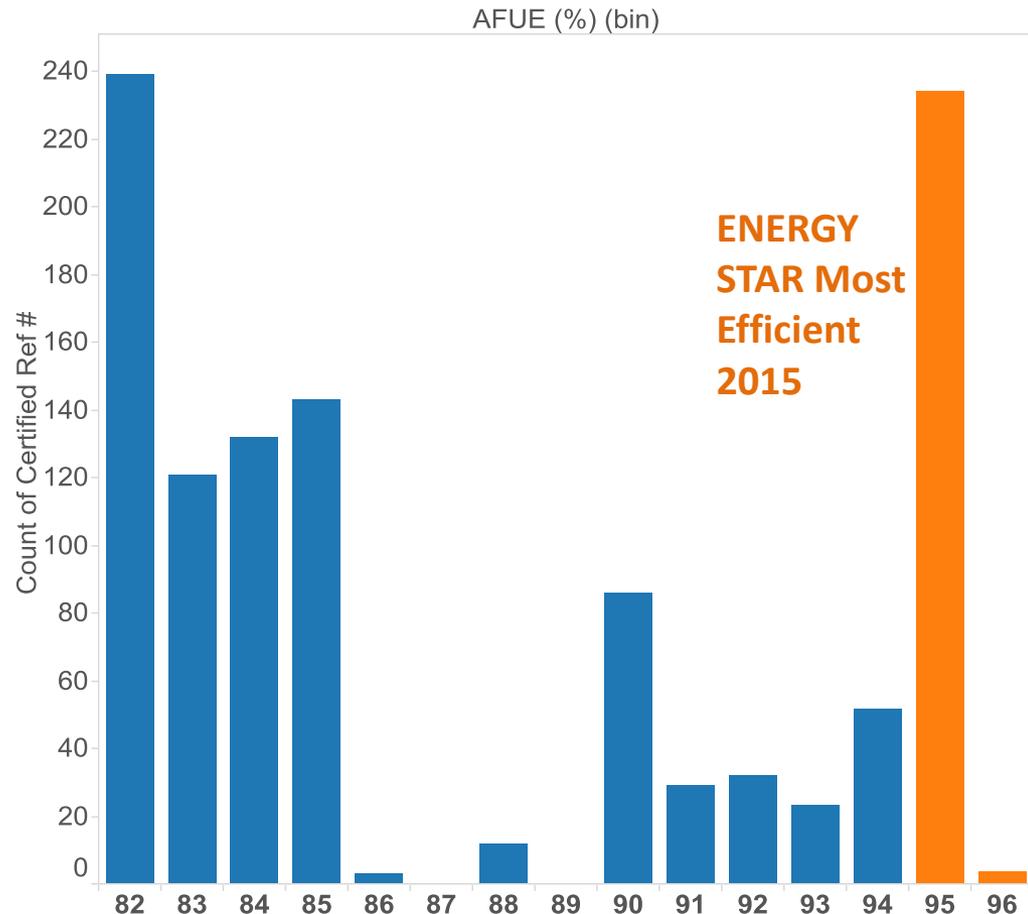
Savings for Heat Pumps and Air Conditioners

System type	2015/16 Savings (North)	2015/16 savings (South)
Split HP	22%	22%
Split AC	28%	22%
Packaged HP	8%	8%
Packaged AC	13%	13%
Ductless HP	25%	25%
Ductless AC	35%	30%
GHP: OL water to water	36%	
GHP: CL water to water	28%	
GHP: OL water to air	44%	
GHP: CL water to air	36%	
GHP: DGX	36%	



Boilers

- **2016 Proposal:** Maintain current criteria. Seek ways to recognize even greater savings in coming years.
- **Rationale:**
- Based on current technology and test method availability, current criteria are best means of recognizing superior efficiency.
- In evaluating 2016 criteria, EPA considered additional measures including establishing standby and off criteria and idle loss for combi boilers that also supply hot water.
- EPA found that these either do not provide differentiation or sufficient additional savings or lack a viable test method.
- EPA will continue to evaluate options with the intention of establishing more stringent requirements in future years



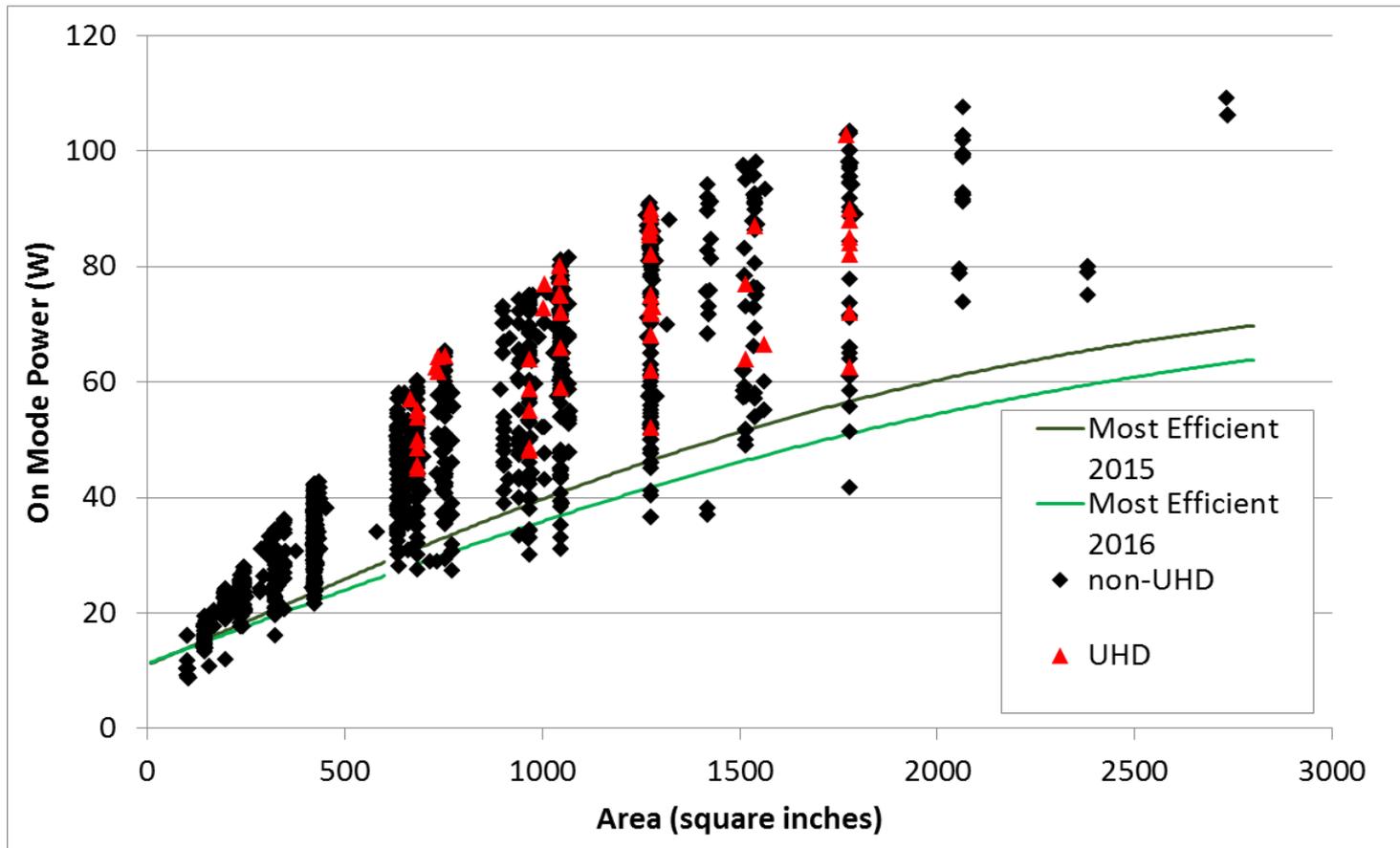
Televisions

- **2016 Proposal:**
 - Revise criteria to capture very best of ENERGY STAR in 2016
- **Rationale:**
 - Based on past years, EPA anticipates many 2016 models will be able to meet ENERGY STAR Most Efficient 2015 criteria, providing opportunity to revise the criteria
 - EPA developed proposed criteria using a robust dataset of more than 1000 unique models and concluded that proposed criteria recognize the best of the best in efficiency



Televisions: HD AND UHD On Mode Power (W)

Dataset as of June 2015





Televisions

2016 Criteria and % Recognized Products

2) Additional requirement:

$$P_{max} = 62 \times \tanh(0.000412 [A-140] + 0.014) + 14$$

P_{max} = maximum allowable On Mode Power consumption in W;

A = viewable screen area of the product in square inches;

tanh = hyperbolic tangent function

Unique Models	All Televisions		
Size	Passing	Total	Rate
<=35	11	386	2.8%
35-50	12	432	2.8%
>50	6	213	2.8%
All	29	1031	2.8%

ALL RESOLUTIONS		
Passing	Total	Rate
11	386	2.8%
12	457	2.6%
6	241	2.5%
29	1084	2.7%



Average Proposed TV Most Efficient 2016 Savings

Size (inches)	Average On Mode Power (W)		% Savings
	Proposed ESME 2016	Conventional Models	
<=35	20	28	29%
35-50	32	53	40%
>50	46	76	40%
All	31	49	37%



Computer Monitors



- **2016 Proposal:**
 - Maintain same level of stringency for ENERGY STAR Most Efficient 2016 as in 2015; translate from modal to a TEC approach
 - Products recognized as ENERGY STAR Most Efficient in 2016 will retain their recognition throughout the year, as long as they meet the Displays Version 7.0 specification when it takes effect
- **Rationale:**
 - ENERGY STAR Most Efficient 2015 models represent 6% of certified models; Market moves more slowly than for TVs, EPA anticipates similar number of models to meet in 2016.
 - Dataset updated May 2015: 1188 unique computer monitors certified to Version 6.0 (1180 AC-powered):
 - ABC enabled by default: 25 models
 - Enhanced Performance Displays: 44 models



Computer Monitors

- The Final Draft ENERGY STAR Version 7.0 specification proposed a Total Energy Consumption (TEC) approach
 - Current ENERGY STAR Most Efficient 2015 criterion is based on On Mode power only:

2) Additional requirements

$$P_{ON_MAX} = (2 \times r) + (0.04 \times A) + 1.5$$

- EPA is proposing to convert the ENERGY STAR Most Efficient 2016 criterion to a TEC approach, in line with the Final Draft Version 7.0 approach:

Equation 2: Calculation of Monitor Maximum TEC (E_{TEC_MAX}) in kWh

$$E_{TEC_MAX} = 6.13 \times r + 89 \times \tanh(0.0016 \times [A - 59] + 0.085) + 9$$

Computer Monitors

2) Additional requirement: 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:

$$E_{TEC_MAX} = 6.13 \times r + 55 \times \tanh(0.003 \times [A - 59] + 0.01) + 5.0$$

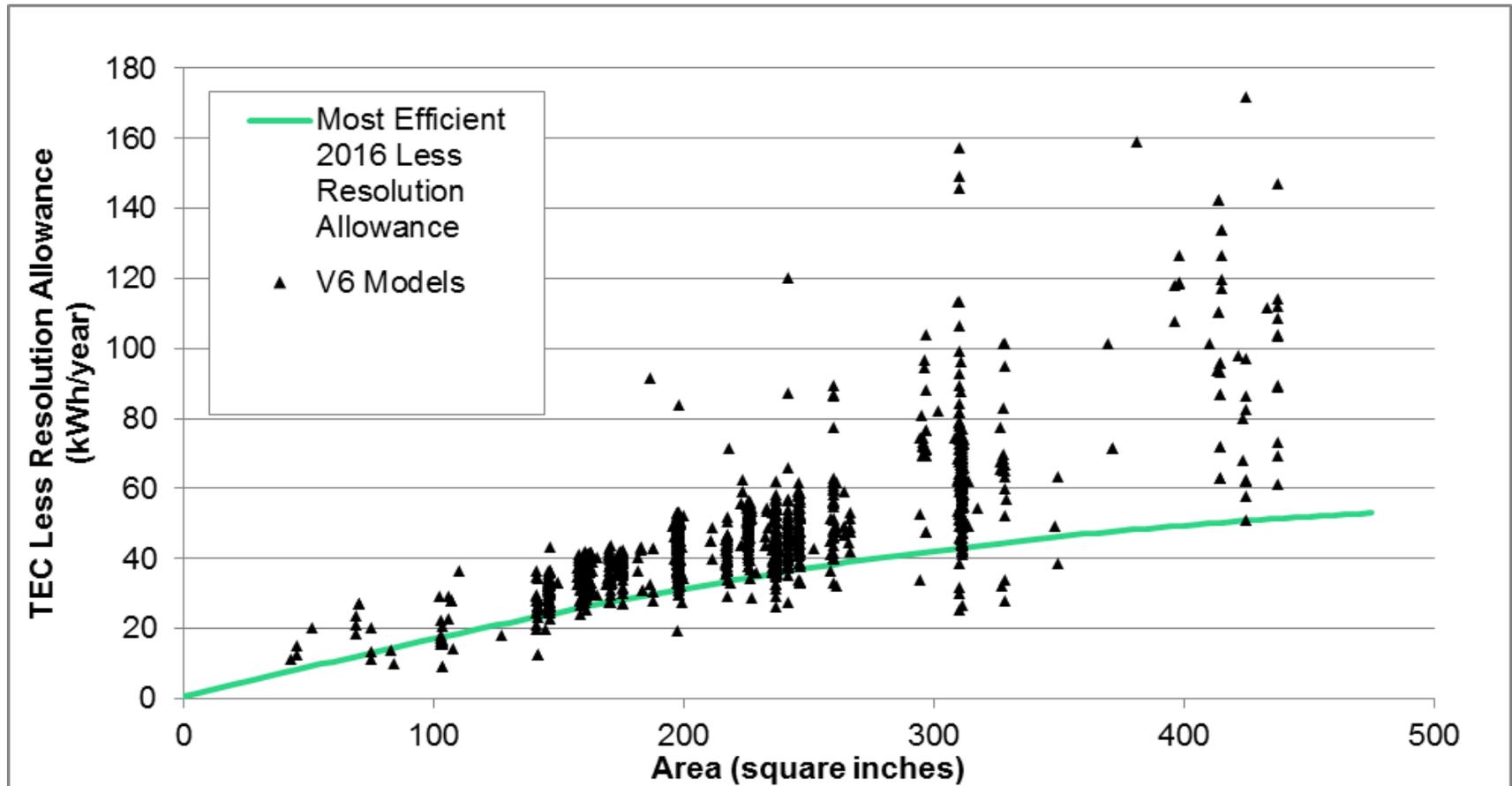
Where:

A = viewable screen area in square inches; \tanh = hyperbolic tangent function; and r = Total Native Resolution in megapixels

*no allowances for enhanced performance, ABC, occupancy sensors, or additional sleep functions

Computer Monitors

Dataset as of May 2015





Average Proposed Computer Monitor Most Efficient 2016 Savings

	Average Total Energy Consumption (TEC) (kWh)		
Size (in)	Proposed 2016 Most Efficient Limit	Conventional Models	% Savings
Under 20	33.5	41.6	20%
20-23	45.1	57.8	22%
Over 23	58.5	83.1	30%
All	48.1	64.9	26%



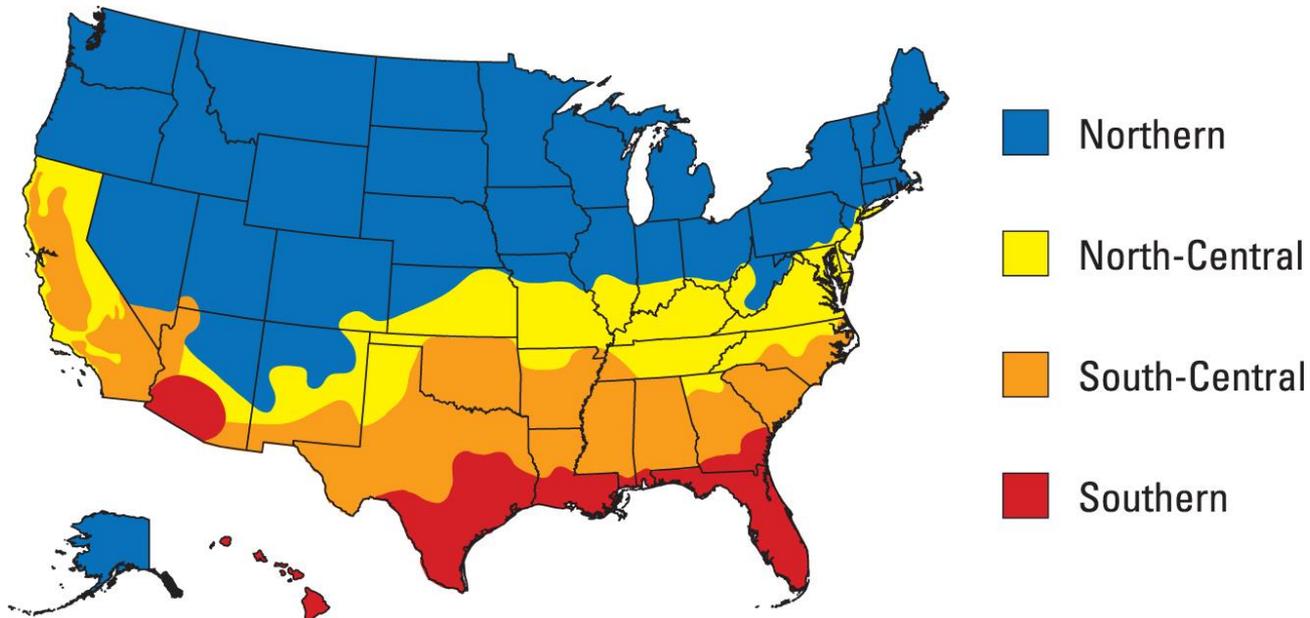
Residential Windows

- **2016 Proposal:**
 - Maintain current U-factor and SHGC criteria (No change)
 - NAFS certification still required to help ensure products can support heavier IGUs (Performance Grade ≥ 15)
 - Residential window products only (No doors, skylights, or TDDs)
- **Rationale:**
 - Products with performance significantly higher than ENERGY STAR minimum criteria are widely available; but still a relatively small slice of total market
 - 46 manufacturers
 - 446 product lines (thousands of product options)
- **Future:**
 - EPA and DOE discussing development of a specification for advanced dynamic window products for ENERGY STAR Most Efficient in 2017



Residential Windows

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 on 2016 criteria may be submitted to MostEfficient@energystar.gov by September 8, 2015
- EPA will finalize the 2016 criteria in late September 2015
- Products will be recognized as ENERGY STAR Most Efficient 2016 beginning January 1, 2016



Contacts

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

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

Melissa Fiffer, EPA-Appliances, fiffer.melissa@epa.gov

Verena Radulovic, EPA-TVs, Monitors, radulovic.verena@epa.gov

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

Ashley Armstrong, DOE-Test Methods, ashley.armstrong@ee.doe.gov

Jennifer Kulp, ICF-Product Recognition, jennifer.kulp@icfi.com

General Inquiries: mostefficient@energystar.gov

Thank you for your participation today.