(v) Computers, Computer Monitors, Televisions, Signage Displays, and Consumer Audio and Video Equipment.

(1) Consumer Audio and Video Equipment. The power usage of consumer audio and video equipment manufactured on or after the effective dates shown shall be not greater than the applicable values shown in Table V-2. For equipment that consists of more than one individually powered product, each with a separate main plug, the individually powered products shall each have a power usage not greater than the applicable values shown in Table V-2.

Table V-2

Standards for Consumer Audio and Video Equipment

Appliance Type	*Effective Date*	*Maximum Power Usage (Watts)*
Compact Audio Products	January 1, 2007	2 W in Audio standby-passive mode for those without a permanently illuminated clock display 4 W in Audio standby-passive mode for those with a permanently illuminated clock display
Digital Versatile Disc Players and Digital Versatile Disc Recorders	January 1, 2006	3 W in Video standby-passive mode

(2) Televisions and Signage Displays. All televisions and signage displays manufactured on or after the effective dates shall meet the requirements shown in Table V-3.

(3) In addition, televisions and signage displays manufactured on or after January 1, 2011 shall meet the requirements shown in Sections 1605.3(v)(3)(A) and 1605.3(v)(3)(B) and 1605.3(v)(3)(C) of this Article.

(A) A television or signage display shall automatically enter TV standby-passive mode or standby-active mode after a maximum of 15 minutes without video or audio input on the selected input mode.

(B) A television or signage display shall enter TV standby-passive mode when turned off by remote or integrated button/switch.

(C) The peak luminance of the product in "home" mode, or in the default mode as shipped, shall not be less than 65% of the peak luminance of the "retail" mode, or the brightest selectable preset mode, of the product.

Table V-3

Standards for Televisions and Signage Displays

Effective Date	*Screen Size (area A in square inches)*	*Maximum TV and Signage Display Standby-passive Mode Power Usage (watts)*	*Maximum On Mode Power Usage (P in Watts)*	*Minimum Power Factor for (P ≥ 100W)*
January 1, 2006	All	3 W	No standard	No standard
January 1, 2013	A < 1400	1W	P ≤ 0.12 X A + 25	0.9

(D) EXCEPTIONS to Sections 1605.3(v)(2) and 1605.3(v)(3):

1. Professional signage displays.

(4) Computer monitors. Computer monitors manufactured on or after July 1, 2019, shall comply with all of the following:

(A) The computer monitor on-mode power draw shall be less than or equal to the following equation with each of the

applicable allowances applied at most once:

$E_{on} \leq (E_{on\_max} + E_{EP} + E_{Game} + E_{OLED} + E_{Curve})$

Where: E_{on} is the computer monitor on-mode power draw in watts as determined under Section 1604(v)(4),

E_{on_max} is the maximum on-mode power draw in watts as determined by Table V-4,

E_{EP} is the enhanced performance display allowance in watts as determined in Table V-5,

E_{Game} is the gaming monitor allowance in watts as determined in Table V-5,

E_{OLED} is the OLED monitor allowance in watts as determined in Table V-5, and

E_{Curve} is the curved monitor allowance in watts as determined in Table V-5.

(B) Consume less than or equal to 1.2 watts in computer monitor sleep mode and computer monitor off mode power combined.

(C) Be shipped with a screen luminance less than or equal to 200 cd/m^2 ± 35 percent. A manufacturer may ship with additional features enabled, even if they were turned off in testing.

(D) Computer monitors with touch screen capability are allowed an additional 1 watt allowance per mode in modes where touch functionality is enabled.

Table V-4

Power Consumption Standards for Computer Monitors

Resolution in megapixels (MP)	Diagonal Screen Size (d) in Inches	Maximum Computer Monitor On Mode Power Consumption in Watts
≤ 5.0 MP	17"≤d≤20"	[(6.0*r) + (0.025*A) + 3.7]
	20"<d<23"	[(4.2*r) + (0.02*A) + 2.2]
	23"≤d<25"	[(4.2*r) + (0.04*A) – 2.4]
	25"≤d<30"	[(4.2*r) + (0.07*A) – 10.2]
	30"≤d≤61"	[(6.0*r) + (0.1*A) – 14.5]
> 5.0 MP	17"≤d≤20"	[25 + (0.025*A) +3.7]
	20"<d<23"	[25 + (0.02*A) +2.2]
	23"≤d<25"	[25 + (0.04*A) – 2.4]
	25"≤d<30"	[25 + (0.07*A) – 10.2]
	30"≤d≤61"	[25 + (0.1*A) – 14.5]
Where: "A" is the monitor screen area in square inches "d" is the diagonal measurement of the display in inches "r" is the megapixel resolution of the display.		

Table V-5

List of Potentially Applicable Allowances

Allowance	*Computer Monitor Type*	*Models manufactured on or after July 1, 2019, and before January 1, 2021*	*Models manufactured on or after January 1, 2021*
E_{EP}	Enhanced Performance Display with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors)	.3 * E_{on_max}	.2 * E_{on_max}
	Enhanced Performance Display with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors)	.75 * E_{on_max}	.6 * E_{on_max}
E_{Game}	Gaming Monitors without incremental hardware-based assistance	.3 * E_{on_max}	.2 * E_{on_max}
	Gaming Monitors with incremental hardware-based assistance	.35 * E_{on_max}	.3 * E_{on_max}
E_{OLED}	OLED monitor	.3* E_{on_max}	.2 * E_{on_max}
E_{Curve}	Curved monitor	.3 * E_{on_max}	.2 * E_{on_max}

(E) EXCEPTIONS to Section 1605.3(v)(4): The following computer monitors are not required to comply with Section 1605.3(v)(4) but shall comply with the test procedures in Section 1604(v)(4), the certification requirements in Section 1606, and the marking requirements in Section 1607:

1. KVMs.

2. KMMs.

3. Very high performance monitors.

(F) EXCEPTION to Section 1605.3(v)(4): Medical computer monitors are not required to comply with Section 1605.3(v)(4) or the test procedures in Section 1604(v)(4) but shall comply with the certification requirements in Section 1606 and the marking requirements in Section 1607.

(5) Desktop computers, thin clients, mobile gaming systems, portable all-in-ones, and notebook computers. Desktop computers, thin clients, mobile gaming systems, portable all-in-ones, and notebook computers manufactured on or after January 1, 2019, shall:

(A) Comply with Table V-7; and

(B) Be shipped with power management settings that do both of the following:

1. Transition the computer into either the computer sleep mode or computer off mode measured in Section 1604(v)(5) within 30 minutes of user inactivity. If the transition is to a computer sleep mode, that sleep mode shall either:

a. Be a computer sleep mode as described in ACPI as S3; or

b. Consume power less than or equal to the values shown in Table V-6.

2. Transition connected displays into sleep mode within 15 minutes of user inactivity.

(C) If the model is shipped at the purchaser's request with either a limited capability operating system or without an operating system, or if the model is not capable of having an operating system, the model is not required to comply with Section 1605.3(v)(5)(B).

(D) Desktop computers and thin clients assembled before July 1, 2021, entirely from parts manufactured before September 1, 2018, are not required to comply with Section 1605.3(v)(5)(A).

Table V-6

Alternative Computer Sleep Mode Power Limits

Computer Type	*Maximum Power Consumption (watts)*
Workstations, Mobile Workstations, High Expandability Computers, Small-Scale Servers	10 + 0.03 * C where C is the system memory capacity in gigabytes minus 32 gigabytes. If C is less than zero, use zero for the value of C.
Desktop Computers, Thin Clients, Mobile Gaming Systems	5 + 0.03 * C where C is the system memory capacity in gigabytes minus 32 gigabytes. If C is less than zero, use zero for the value of C.
Notebook Computers, Portable All-In-Ones	2.5 + 0.03 * C where C is the system memory capacity in gigabytes minus 16 gigabytes. If C is less than zero, use zero for the value of C. If a discrete GPU is present in the system, the maximum power consumption limit shall be increased by an additional 2 watts.

Table V-7

Energy Consumption Standards for Desktop Computers, Thin Clients, Notebook Computers, Mobile Gaming Systems, and Portable All-in-Ones

Computer Type	*For models manufactured on or after January 1, 2019, and before July 1, 2021, the measured annual energy consumption shall be less than or equal to the values below.*	*For models manufactured on or after July 1, 2021, the measured annual energy consumption shall be less than or equal to the values below.*
Desktop Computers, mobile gaming systems, and thin clients with an ES of 250 or less	50 kWh/yr + applicable adders in Table V-8	50 kWh/yr + applicable adders in Table V-8
Desktop Computers, mobile gaming systems, and thin clients with an ES of more than 250 but no more than 425	80 kWh/yr + applicable adders in Table V-8	60 kWh/yr + applicable adders in Table V-8
Desktop Computers, mobile gaming systems, and thin clients with an ES of more than 425 but no more than 690	100 kWh/yr + applicable adders in Table V-8	75 kWh/yr + applicable adders in Table V-8
Notebook computers and portable all-in-ones	30 kWh/yr + applicable adders in Table V-8	30 kWh/yr + applicable adders in Table V-8
Minimum power factor of a computer power supply that is not a federally-regulated external power supply	0.9 measured at full load	0.9 measured at full load

Table V-8

List of Potentially Applicable Adders

Function	*Desktop Computer, Mobile Gaming System, and Thin Client Adder (kWh/yr)*	*Notebook Computers and Portable All-In-One Adder (kWh/yr)*
System Memory	4 + 0.15 * C where C is the capacity in GB.	4 + 0.15 * C where C is the capacity in GB.
Energy-Efficient Ethernet	0.9 per computer	0.9 per computer
Storage device other than main storage device	3.5-inch Drive: 26 2.5-inch Drive: 4.5 Solid-State Drive (SSD): 0.5 Solid-State Hybrid Drive (SSHD): 1.0 Other: 26 per storage device	2.6 per storage device
Integrated Display Where: "d" is the diagonal measurement of the display in inches "r" is the megapixel resolution of the display "A" is the viewable screen area in square inches EP=0 for displays that are not enhanced performance displays	For d≤20: (8.76*0.35*(1+EP)* [(4.2*r)+5.7])*0.8 For 20<d<23: (8.76*0.35*(1+EP)* [(4.2*r)+(0.02*A)+2.2])*0.8 For 23≤d<25: (8.76*0.35*(1+EP)* [(4.2*r)+(0.04*A)-2.4])*0.8 For 25≤d: (8.76*0.35*(1+EP)* [(4.2*r)+(0.07*A)-10.2])*0.8 r=6 for resolutions greater than 6 megapixels. Before July 1, 2021: EP=0.3 for displays with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors); and EP=0.75 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors). On or after July 1, 2021: EP=0.2 for displays with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors); and EP=0.6 for displays with a color	8.76*0.3*(1+EP)* [(0.43*r)+(0.0263*A)] r=6 for resolutions greater than 6 megapixels. EP=0.4 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).

	gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).	
First Discrete GPU (on or after January 1, 2019 and before July 1, 2021) Where "B" is frame buffer bandwidth measured in GB/s	58.6*tanh(0.0038*B-0.137)+26.8	29.3*tanh(0.0038*B-0.137)+13.4
First Discrete GPU (on or after July 1, 2021) Where "B" is frame buffer bandwidth measured in GB/s	29.4*tanh(0.008*B-0.03)+11+(0.011*B)	14.7*tanh(0.008*B-0.03)+5.5+(0.0055*B)
Additional Discrete GPU	11 per GPU	5.5 per GPU
Add-in Cards This adder does not apply if either of the following criteria is met: 1) An adder is claimed for a device connected through this add-in card; or 2) An interface score from Table V-1 applies to a slot or interface provided by this add-in card.	10 per card	5 per card
Video Surveillance Card	25 per card	12.5 per card
Wired Ethernet or Fiber Card with a transmit rate of 10 Gb/s or greater	25 per card	12.5 per card
High bandwidth system memory, where "S" is system memory bandwidth measured in GB/s. This adder does not apply to a computer that meets any of the following criteria: 1) Expandability score includes a credit for 4-channel memory. 2) System memory bandwidth is less than 146 GB/s. 3) Less than 4 GB of the system memory has a bandwidth of 146 GB/s or more and either: a) Has an integrated display with a resolution of 9 megapixels or less; or b) Does not have an integrated display. 4) Uses an adder for a first discrete GPU.	22.78*tanh(0.006*(S-70)+0.15]-12.33	9.11*tanh[0.006*(S-70)+0.15]-4.45

(6) Small-scale servers, high expandability computers, mobile workstations, and workstations. Small-scale servers, high expandability computers, mobile workstations, and workstations manufactured on or after January 1, 2018, shall:

(A) Be powered by an internal power supply that meets or exceeds the standards in Table V-9, or an external power supply that meets the level VI of efficiency described in the *International Efficiency Marking Protocol for External Power Supplies Version 3.0* (Sept. 2013);

(B) Incorporate Energy-Efficient Ethernet functionality;

(C) Transition connected displays into sleep mode within 15 minutes of user inactivity; and

(D) Transition the computer into either the computer sleep mode or computer off mode measured in Section 1604(v)(5) within 30 minutes of user inactivity. If the transition is to a computer sleep mode, that sleep mode shall either:

1. Be a computer sleep mode as described in ACPI as S3; or

2. Consume power less than or equal to the values shown in Table V-6.

Small-scale servers and rack-mounted workstations are not required to comply with Section 1605.3(v)(6)(D).

Table V-9

Internal Power Supply Requirements

115V power supplies				
10% load	20% load	50% load	100% load	Power Factor Correction
-	87%	90%	87%	0.9 at 50% load
230V power supplies				
10% load	20% load	50% load	100% load	Power Factor Correction
-	88%	92%	88%	0.9 at 50% load

(7) Small volume manufacturers.

(A) Computers manufactured on or after January 1, 2019, by a small volume manufacturer shall:

1. Comply with the power management settings identified in Sections 1605.3(v)(5)(B)(2) and 1605.3(v)(6)(C);

2. Be shipped with power management settings that transition the computer into either computer sleep mode or computer off mode within 30 minutes of user inactivity; and

3. Be exempt from all other requirements for computers unless the small volume manufacturer meets the criteria in Section

1605.3(v)(7)(C).

(B) Small-scale servers and rack-mounted workstations are not required to comply with Section 1605.3(v)(7)(A)(2).

(C) If a small volume manufacturer produces desktop or workstation computers in quantities of more than 50 units of a basic model, the manufacturer shall certify those units as meeting the requirements in Sections 1603, 1604(v)(5), 1605.3(v)(5) or 1605.3(v)(6), 1606, and 1607.