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CALIFORNIA ENERGY COMMISSION
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Sacramento, California 95814

Main website: www.energy.ca.gov

Notice of Availability of Additional 15-Day Language

Computers, Computer Monitors, and Signage Displays
Appliance Efficiency Rulemaking

California Energy Commission
Docket No. 16-AAER-02

INTRODUCTION

On September 9, 2016, the California Energy Commission published a Notice of Proposed Action suggesting modifications to the Energy Commission's appliance efficiency regulations to include energy efficiency standards for computers and computer monitors; to clarify that signage displays are subject to the television efficiency standards; and to clarify that certain appliances are not included in the battery charger systems efficiency standard. Subsequent to adoption of the proposed regulations on December 14, 2016, it has been determined that four changes are necessary for clarity and to ensure that the regulations are easy to implement when they first become effective in 2018. These minor modifications include a change necessary to respond to a comment about the test procedure for automatic brightness control raised at the December adoption hearing, clarifying what test methods to apply to certain products, adding a required field to the database, and correcting a typographical error. The proposed changes do not change the energy savings expected from the standards, and the standards will continue to take effect January 1, 2018.

The Energy Commission invites the public to review and comment on these changes. The proposed revisions are summarized below and included in this notice. Additionally, the proposed revisions and other supporting documents are available on the Energy Commission website at http://www.energy.ca.gov/appliances/2016-AAER-02/rulemaking/.

The public may also request copies of the proposed regulations by contacting Angelica Romo-Ramos at Angelica.Romo@energy.ca.gov or (916) 654-4147.

Additionally, the Energy Commission has available the information upon which the proposed regulations are based at the website listed above. For those without internet access, copies or assistance can be obtained by contacting Angelica Romo-Ramos at Angelica.Romo@energy.ca.gov or (916) 654-4147.

The Energy Commission has the entire rulemaking file available for inspection and copying throughout the rulemaking process at its office at 1516 Ninth Street, Sacramento, CA 95814.

BACKGROUND

The Energy Commission is charged with reducing the inefficient consumption of energy and water by prescribing efficiency standards and other cost-effective measures for appliances that require a significant amount of energy and water to operate on a statewide basis. Such standards must be technologically feasible and attainable and must not result in any added total cost to the consumer over the designed life of the appliance. The Energy Commission adopted proposed standards for computers and computer monitors on December 14, 2016.

The standard for computers includes test procedures for integrated displays, some of which have an automatic brightness control (ABC) feature. ABC automatically adjusts the brightness of the display based on the ambient light in the room. If implemented correctly, the ABC feature saves energy without a noticeable change in screen brightness. However, some manufacturers have implemented ABC systems that are not efficient and do not save energy. ENERGY STAR's test procedure for computers, which was largely incorporated as the state's test procedure for computers, requires ABC to be disabled during testing. As a result, ENERGY STAR does not distinguish between energy-efficient and energy-inefficient ABC implementation. The Energy Commission's adopted standards include a test procedure for computers with integrated displays that was intended to measure the energy use associated with ABC.

At the time of adoption, the Information Technology Industry Council (ITI), a trade association representing manufacturers of computers and computer monitors, raised concerns about this test procedure. The Energy Commission agreed to consider changes to the ABC test procedure to more accurately reflect real world settings in a future rulemaking.

After reviewing the available data on ABC testing and "real world" conditions, staff concludes that more comprehensive research and data collection is needed in order to develop a test procedure that is repeatable, reliable, and accurately reflects ABC's energy-saving benefits. This type of work would extend well past January 1, 2018, the effective date of the computer standards. Therefore, staff believes that the best approach is to amend the test procedure for computers with integrated displays to align with the ENERGY STAR's test procedure for computers v.6.1. This approach allows certainty for testing well before the effective date of the standards, as well as clarity as to whether products will meet the standards.

Additionally, staff noticed that clarification to the regulations is needed to identify the correct test configuration for computers that have definitions different from ENERGY STAR. This includes high expandability computers, mobile gaming systems, and mobile

workstations. Staff proposes to add clarifying language that matches the state's new definitions with the corresponding test procedure requirements for similar products in ENERGY STAR.

Lastly, staff is making two minor corrections to the Section 1606 listing of appliances in the database. The first correction is to include "rack-mounted workstations" in Table X. Rack-mounted workstations are exempt from some parts of the computer standards and need to be identified in the database for verification of their compliance. The last correction removes a typographical error in reference to cold cathode fluorescent lamp (CCFL) monitors.

PROPOSED 15-DAY LANGUAGE

The 15-Day Language changes identified in this notice do the following:

- Modify the testing procedure for computers to align with ENERGY STAR Specification for Computers v.6.1 guidance to disable automatic brightness control.

- Add language clarifying that when conducting the ENERGY STAR testing for computers, high expandability computers should use the desktop computer configuration, and mobile gaming systems and mobile workstations should use the notebook computer configuration, identified in ENERGY STAR v.6.1.

- Include "rack-mounted workstations" in Table X.

- Correct a typographical error for CCFL monitors in Table X.

ADDITIONAL DOCUMENTS RELIED UPON

No additional documents were relied upon for the 15-day Language.

PUBLIC HEARING

The Energy Commission will consider adopting the proposed regulations during its regularly scheduled business meeting on:

Wednesday, May 10, 2017
10:00 a.m.
California Energy Commission
1516 Ninth Street
Art Rosenfeld Hearing Room
Sacramento, California
(Wheelchair accessible)

Remote Access Available by Computer or Phone via WebEx™
(see instructions below)

Instructions for accessing Energy Commission hearings using either method can be found at: http://www.energy.ca.gov/webcast/index.html. If you have a disability and require assistance to participate in these hearings, please contact Poneh Jones at Poneh.Jones@energy.ca.gov or (916) 654-4425, at least five days in advance.

PUBLIC COMMENT

Any interested person may submit written comments on the proposed changes. The written comment period for the 15-Day Language will be from April 24, 2017, through 5:00 PM on May 9, 2017.

Please submit comments using the e-commenting feature on the Commission's 2016 Appliance Efficiency Rulemaking webpage http://www.energy.ca.gov/appliances/2016-AAER-02/rulemaking/. Click on "Submit e-comment." A full name, email address, comment title, and either a comment or an attached document (.doc, .docx, or .pdf format) is mandatory. After a challenge-response test used by the system to ensure that responses are generated by a human user and not a computer, click on the "Agree & Submit Your Comment" button to submit the comment to the Commission Dockets Unit.

Please note that written comments, attachments, and associated contact information included within the written comments and attachments (e.g., your address, phone, email) become part of the viewable public record.

You are encouraged to use the electronic filing system, described above, to submit comments. If you are unable to submit electronically, a paper copy of your comments may be sent to:

California Energy Commission
Docket No. 16-AAER-02
Docket Unit
1516 Ninth Street, MS-4
Sacramento, CA 95814-5504

Or email them to: DOCKET@energy.ca.gov

The Energy Commission will also accept oral comments during the hearing on May 10, 2017. Comments may be limited to three minutes per speaker. All comments will become part of the public record of this proceeding.

PUBLIC ADVISER AND OTHER COMMISSION CONTACTS

The Energy Commission's Public Adviser's Office is available to assist any person who wishes to participate in this proceeding. If you want information on how to participate in this proceeding, please contact the Public Adviser, Alana Mathews, at PublicAdviser@energy.ca.gov or (916) 654-4489, or toll-free in California at (800) 822-6228.

News media inquiries should be directed to the Media and Public Communications Office at (916) 654-4989, or by email at mediaoffice@energy.ca.gov.

If you have questions on the subject matter of this proceeding, please contact Soheila Pasha at soheila.pasha@energy.ca.gov or (916) 657-1002. If you have legal questions about this proceeding, please contact Senior Attorney Lisa DeCarlo at lisa.decarlo@energy.ca.gov or (916) 654-5195.

Proposed Regulatory Language

Proposed additional 15-day language is limited to section 1604(v)(5)(F) and 1606, and appears in **~~bold strikethrough~~** and **bold underline**. Proposed 15-day language appears as double underline (example) and proposed deletions appear as double strikeout (example). Proposed 45-day language appears as underline (example) and proposed deletions appear as strikeout (~~example~~). Existing language appears as plain text. Three dots or "…" represents the substance of the regulations that exists between the proposed language and current language.

Chapter 1 1601. Scope.

…

(v) Computers, computer monitors, ~~T~~televisions, and consumer audio and video equipment, which are compact audio products, digital versatile disc players, and digital versatile disc recorders.

…

(w) Battery charger systems, except those:

(1) used to charge a motor vehicle that is powered by an electric motor drawing current from rechargeable storage batteries, fuel cells, or other portable sources of electrical current, and which may include a nonelectrical source of power designed to charge batteries and components thereof. This exception does not apply to forklifts and autoettes, electric personal assistive mobility devices, golf carts, or low speed vehicles, as those vehicles are defined in Division 1 of the California Vehicle Code;

(2) that are classified as Class II or Class III devices for human use under the Federal Food, Drug, and Cosmetic Act and require U.S. Food and Drug Administration listing and approval as a medical device;

(3) used to charge a battery or batteries in an illuminated exit sign, as defined in Section 1602(*l*);

(4) with input that is three phase of line-to-line 300 volts root mean square or more and is designed for a stationary power application;

(5) that are battery analyzers; ~~or~~

(6) that are voltage independent or voltage and frequency independent uninterruptible power supplies as defined by IEC 62040-3 ed.2.0 (March 2011); or

(7) that are contained completely within a larger product and that:

(a) provide power for data storage or for continuity within volatile cache or memory systems;

(b) maintain information for system use; and

(c) the battery is not capable of powering full operation of the product when AC mains power is removed.

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c), 25402.5.4 and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Chapter 2 1602. Definitions.

Chapter 3 (a) General.

…

"Basic model" of a computer means a group of computer models that are made by a single manufacturer and that have the same chassis, power supply, motherboard, and expandability score. The chassis shall be considered the same if the energy use characteristics are not modified by variations in the chassis, such as a change in color.

…

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

"Add-in card" means a removable device that can be installed in a computer peripheral component interconnect (PCI) or other slot. Add-in card does not include hard-disks, system memory, ~~or~~ removable devices that are intended to operate outside of a computer chassis, or other components that are listed in Table V-8. It also does not include cards, such as riser cards, that split~~,~~ or physically extend~~, or convert a slot type~~ a motherboard slot.

"Computer" means a device that performs logical operations and processes data. A computer includes both stationary and portable units and includes a desktop computer, a portable all-in-one, a notebook computer, a mobile gaming system, a high expandability computer, a small-scale server, a thin client, and a workstation. Although a computer is capable of using input devices and displays, such devices are not required to be included with the computer when the computer is shipped. A computer is composed of, at a minimum:

(1) A central processing unit (CPU) to perform operations or, if no CPU is present, then the device must function as a client gateway to a server and the server acts as a computational CPU;

(2) Ability to support user input devices such as a keyboard, mouse, or touchpad; and

(3) An integrated display screen or the ability to support an external display screen to output information.

The term "computer" does not include a tablet, a game console, a television, a small computer device, a server other than a small-scale server, or an industrial computer.

"Computer monitor" means an analog or digital device of diagonal screen size greater than or equal to 17 inches and less than or equal to 61 inches, that has a pixel density of greater than 5000 pixels per square inch, and that is designed primarily for the display of computer generated signals ~~not marketed for use as a television~~ for viewing by one person in a desk-based environment. A computer monitor is composed of a display screen and associated electronics.

A computer monitor does not include:

(1) Displays with integrated or replaceable batteries designed to support primary operation without AC mains or external DC power, (e.g., electronic readers, mobile phones, ~~portable~~ tablets, battery-powered digital picture frames)~~.~~; or

(2) A television or a signage display.

"Computer monitor off mode" means the computer monitor is connected to a power source, produces no visual information, and cannot be switched into any other mode with a remote control unit, an internal signal, or an external signal.

"Computer monitor sleep mode" means a low-power mode in which the computer monitor provides one or more non-primary protective functions or continuous functions.

"Computer off mode" means an ACPI System Level S5 state.

"Computer sleep mode" means a low-power mode that the computer enters automatically after a period of inactivity or by manual selection. A computer with sleep capability can quickly "wake" in response to network connections or user interface devices with a latency of less than or equal to five seconds from initiation of the wake event to the system becoming fully usable, including rendering of display. For systems where ACPI standards are applicable, computer sleep mode is ACPI System Level S3 (suspend to RAM) state. Some computers utilize an alternative sleep mode to ACPI S3.

"Desktop computer" means a computer whose main unit is designed to be located in a fixed location, often on a desk or on the floor. A desktop computer includes an integrated desktop computer. A workstation, a high expandability computer, or a small-scale server is not a desktop computer.

"Digital Cinema Initiative (DCI)-P3" means a red-green-blue (RGB) color space that covers 41.7% of the CIELUV color space ~~that features the widest color gamut of all of the emulated color spaces and that is wider than standard RGB (sRGB)~~.

~~"Discrete Graphics" or~~ "Discrete ~~Graphics~~ GPU" means a graphics processing unit (GPU) with a local memory controller interface and local graphics-specific memory. Discrete GPUs are not packaged on the same die or substrate as the CPU.

"Energy-Efficient Ethernet capability" means Ethernet interfaces that are capable of reducing power consumption during times of low data throughput, as specified in *IEEE 802.3az-2010*.

"Enhanced-performance display (EPD)" means a computer monitor that has all of the following features and functionalities:

(1) A contrast ratio of at least 60:1 measured at a horizontal viewing angle of at least 85º, with or without a screen cover glass;

(2) A native resolution equal to or greater than 2.3 megapixels (MP); and

(3) A color gamut size of at least sRGB as defined by *IEC 61966-2-~~2~~1:1999*. Shifts in color space are allowable as long as 99 percent or more of defined sRGB colors are supported.

"Expandability score" means the results of a calculation designed to estimate a computer's power supply capacity based on the power draw if each interface present in the system were operated at their designed maximum voltage and current.

"First Discrete GPU" means the computer's discrete GPU that has the highest frame buffer bandwidth measured in gigabytes per second (GB/s).

"Frame buffer bandwidth" means the amount of data that is processed per second by a discrete GPU, ~~the rate at which data can be read from or stored within discrete, integrated, or hybrid graphics,~~ expressed in gigabytes per second (GB/s). It is calculated based on Ecma International Standard ECMA-383 (December 2010).

"Game console" means a device that is designed and marketed primarily for video game usage and that the consumer does not have the ability to add or remove system memory or a central processing unit.

"Gaming monitor" means a computer monitor that is capable of adjusting the monitor refresh rate with the frame rate of the video content, and supports a continuously variable refresh rate ranging across a factor of at least 1.75 times the minimum supported (for example a variable refresh rate of at least 40Hz to 70Hz if the minimum supported refresh rate is 40Hz); the monitor may include an incremental hardware-based assistance.

"Graphical user interface (GUI)" means a user interface, beyond a text-based interface, that allows users to interact with electronic devices through graphical icons and visual indicators.

"Graphics processing unit (GPU)" means an integrated circuit~~, separate from the CPU,~~ designed to accelerate the rendering of two-dimensional or three-dimensional content to displays. A GPU may be either integrated with the CPU or discrete.

"High expandability computer" means a computer with any of the following:

(1) An expandability score of more than 690;

(2) If the computer is manufactured before January 1, 2020, a power supply of 600 watts or greater and either:

(i) a first discrete GPU ~~discrete or integrated graphics~~ with a frame buffer bandwidth of 400 gigabytes per second (GB/s) or greater; or

(ii) a total of 8 gigabytes or more of system memory with a bandwidth of 432 GB/s or more and an integrated GPU.

(3) If the computer is manufactured on or after January 1, 2020, a power supply of 600 watts or greater and either:

(i) a first discrete GPU ~~discrete or integrated graphics~~ with a frame buffer bandwidth of 600 gigabytes per second (GB/s) or greater; or

(ii) a total of 8 gigabytes or more of system memory with a bandwidth of 632 GB/s or more and an integrated GPU.

"Hybrid graphics" means a functionality that ~~allows~~ automatically places the system's first ~~D~~discrete GPU~~Graphics to enter~~ in a low-power state when not required in favor of an integrated GPU~~Integrated Graphics~~. This functionality allows graphics rendering by lower power and lower capability integrated GPUs while on battery or when the output graphics are not overly complex while then allowing the more power consumptive but more capable discrete GPU to provide rendering capability when the system requires it.

"Idle condition" means an active state of a computer where no user interaction is occurring and where no user-prescribed task is underway.

"Industrial computer" means any of the following:

(1) A process controller that is designed specifically to automate an industrial, medical, or laboratory process.

(2) A computer that is integrated into the chassis of industrial, medical, or laboratory equipment that contains more than a computer, and that is designed specifically to perform logical operations and process data for an industrial, medical, or laboratory product using product-specific software.

"Integrated desktop computer" means a desktop computer in which the computing hardware and display are integrated into a single housing, and which is connected to AC power through a single cable. Integrated desktop computers come in one of two forms: (1) a system where the display and computer are physically combined into a single unit; or (2) a system packaged as a single system where the display is separate but is connected to the main chassis by a DC power cord, and both the computer and display are powered from a single power supply.

"Integrated ~~graphics~~GPU" means a graphics solution that does not contain ~~discrete graphics~~a discrete GPU.

"Keyboard, video, and mouse (KVM)" or "keyboard, mouse, and monitor (KMM)" means a computer monitor that can operate with a KVM switch and is designed to be used in a server rack for use solely in a data center.

"Limited capability operating system" means an operating system that performs basic operations and that meets all of the following criteria ~~does not~~:

(1) ~~Have~~ Does not have automatic power management features;

(2) ~~Support~~ Does not support USB devices;

(3) ~~Have~~ Does not have ~~Graphical User Interface (~~GUI~~);~~ ~~or~~ and

(4) ~~Support~~Does not support multiple user profiles or distinguish between users.

"Long-idle mode" means a state where the computer has reached an idle condition 15 minutes after operating system boot, after completing an active workload, or after resuming from computer sleep mode, and the primary computer display has entered a low-power state where screen contents cannot be observed (for example, backlight has been turned off) but remains in the working mode ACPI G0.

"Main storage" means the largest capacity non-volatile storage device present in the system.

"Medical computer monitor" means a computer monitor that meets the definition of a device contained in Section 210(h) of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. § 321(h)) and is listed and approved as such by the U.S. Food and Drug Administration.

"Mobile gaming system" means a computer that is primarily used for gaming and that is designed specifically for portability and to be operated for extended periods both with and without a direct connection to an AC mains power

source. A mobile gaming system is sold with an integrated display and a physical keyboard, and has all of the following criteria:

1) ~~Discrete video card~~First discrete GPU with frame buffer bandwidth of 128 gigabytes per second or greater;
2) System memory of 16 gigabytes or more;
3) An external power supply with a nameplate output power ~~AC adapter size~~ of 150 watts or greater; and
4) Total battery capacity of 90 watt-hours or greater.

"Mobile thin client" means a notebook computer that relies on a connection to remote computing resources, such as a computer server or a remote workstation, to obtain primary functionality, and does not have integral rotational storage media.

"Mobile workstation" means a high-performance, single-user computer primarily used for graphics, computer-aided design (CAD), software development, financial, or scientific applications, among other computation intensive tasks, excluding game play, and that is designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an external power source. Mobile workstations utilize an integrated display and are capable of operation on an integrated battery. A mobile workstation may use an external power supply and have an integrated keyboard and pointing device. In addition, a mobile workstation must meet all of the following criteria:

(1) Has a mean time between failures (MTBF) of at least 13,000 hours;

(2) Has qualified or is currently being reviewed for qualification by two or more independent software vendor (ISV) product certifications;

(3) Has either:

(i) ~~a~~At least one ~~integrated or~~ discrete GPU ~~graphics processing unit~~ with frame buffer bandwidth of ~~134~~ 96 gigabytes per second or greater; or

(ii) A total of 4 gigabytes or more of system memory with a bandwidth of 134 gigabytes per second or greater and an integrated GPU;

(4) Supports the inclusion of three or more internal storage devices; and

(5) Supports at least 32 gigabytes of system memory.

"Monitor screen area" means the viewable screen area of the computer monitor, calculated by multiplying the viewable image width by the viewable image height. For curved screens, the measurements shall be made along the curvature on the face of the screen rather than along a straight line or chord.

"Native resolution" means the physically present number and size of pixels in a display panel.

"Notebook computer" means a computer designed specifically for portability and to be operated for extended periods both with and without a direct connection to an AC mains power source. A notebook computer is sold with an integrated display and a physical keyboard. The term "notebook computer" includes two-in-one notebooks, mobile

thin clients, and notebook computer models with touch-sensitive screens. Notebook computer does not include mobile workstations or mobile gaming systems.

~~"Off mode" means an ACPI System Level S5 state.~~

"Organic light-emitting diode (OLED) monitor" means a monitor in which the emissive electroluminescent layer of the light-emitting diode is a film of organic compound that emits light in response to an electric current.

"Portable all-in-one" means a computer designed for limited portability that meets all of the following criteria:

(1) Includes an integrated display with a diagonal size greater than or equal to 17.4 inches;

(2) Does not have a keyboard integrated into the physical housing of the product in its as-shipped configuration;

(3) Includes and primarily relies on touch-screen input, with optional keyboard;

(4) Includes the capacity to connect to a wireless network; and

(5) Includes an internal battery that can power the computer's primary functions.

~~"Primary storage" means the largest capacity non-volatile storage device present in the system.~~

"Professional signage display" means an electronic display that is:

(1) Composed of an area greater than 1,400 square inches;

(2) Composed of two or more display panels, each with a diagonal size greater than 12 inches;

(3) Designed to be operated by an external data controller; and

(4) Designed and marketed for viewing by multiple people in a non-desk-based environment. Examples of such environments include stadiums, airports, and convention centers.

"Rack-mounted workstation" means a workstation that is designed to be natively rack mounted as described in *IEC 60297-3-101:2004*. The rack-mounted workstation may be accessed locally by direct connection to the workstation and display or accessed remotely across a network by one or more users.

"Short-idle mode" means a state where the computer has reached an idle condition five minutes after operating system boot, after completing an active workload, or after resuming from computer sleep mode, and the primary computer display is on and the computer remains in the working mode ACPI G0 (S0).

"Signage display" means an analog or digital device designed primarily for the display of computer-generated signals that is not marketed for use as a computer monitor or a television.

~~"Sleep mode" means a low-power mode that the computer enters automatically after a period of inactivity or by manual selection. A computer with sleep capability can quickly "wake" in response to network connections or user interface devices with a latency of less than or equal to five seconds from initiation of the wake event to the system becoming fully usable, including rendering of display. For systems where ACPI standards are applicable, sleep mode is ACPI System Level S3 (suspend to RAM) state. Some computers utilize an alternative sleep mode to ACPI S3.~~

"Small computer device" means a computer system with an integrated and primary display that has a screen area of 20 square inches or less.

"Small-scale server" means a computer that uses desktop components in a desktop form factor but that is designed to be a storage host for other computers. A small-scale server is designed to perform functions such as providing network infrastructure services (for example, archiving) and hosting data and media. This product is not designed to process information for other systems or run Web servers as a primary function. A small-scale server has all the following characteristics:

(1) Designed in a pedestal, tower, or other form factor similar to those of desktop computers such that all data processing, storage, and network interfacing is contained within one box or product;

(2) Designed to operate continuously, except for maintenance;

(3) Capable of operating in a simultaneous multi-user environment serving several users through networked client units; and

(4) Designed for an industry-accepted operating system for home or low-end server applications (e.g., Windows Home Server, Mac OS X Server, Linux, UNIX, Solaris).

"Small volume manufacturer" means a manufacturer that meets all of the following criteria:

(1) The manufacturer's gross revenues from the 12-month period preceding the certification, from all of the entity's operations, including operations of any other person or business entity that controls, is controlled by, or is under common control of the entity, is $2,000,000 or less;

(2) The manufacturer assembles and sells the computers at the same location; and.

(3) The manufacturer has certified as a small volume manufacturer to the Energy Commission under Section 1606(k).

"System memory bandwidth" means the rate at which data can be read from or stored into the computer system's memory, expressed in gigabytes per second (GB/s).

"Tablet" means a device that is designed for portability and that meets all of the following criteria:

(1) Has an integrated display with a diagonal size less than 17.4 inches;

(2) Does not have an integrated, physically attached keyboard in its as-shipped configuration;

(3) Has and primarily relies on touch-screen input;

(4) Has and primarily relies on a wireless network connection; and

(5) Has and is primarily powered by an internal battery with connection to an AC mains power source for battery charging and not for primary powering of the device.

A tablet may be referred to as a slate.

"Thin client" means an independently powered computer that relies on a connection to remote computing resources (for example, a computer server or a remote workstation) to obtain primary functionality. Main computing functions (for example, program execution, data storage, interaction with other internet resources) are provided by remote

computing resources. A thin client does not have integral rotational storage media and is designed for use in a fixed location during operation.

"Two-in-one notebook" means a notebook computer which has a clam shell form factor, but has a detachable keyboard. The keyboard and display portions of the product must be shipped as an integrated unit.

"Very high performance monitor~~s~~" means a computer monitor that meets all of the following criteria:

(1) Has a diagonal screen size of 27 inches or greater;

(2) Has a native resolution equal to or greater than either 3840x2160 pixels or 8.29 Megapixels; ~~and~~

(3) Has a color space greater than 99 percent of defined Adobe RGB color or greater than 99 percent of Digital Cinema Initiative (DCI)-P3 colors~~.~~; and

(4) Has a contrast ratio of at least 60:1 measured at a horizontal viewing angle of at least 85º, with or without a screen cover glass.

"Workstation" means a computer used for graphics, computer-aided design (CAD), software development, financial, or scientific applications, among other computation intensive tasks. A workstation covered by this specification must meet the following criteria:

(1) Product as shipped does not support altering frequency or voltage beyond the computer processing unit and GPU manufacturers' operating specifications;

(2) Has system hardware that supports error-correcting code (ECC) that detects and corrects errors with dedicated circuitry on and across the CPU, interconnect, and system memory; and

(3) Meets two or more of the following criteria:

(A) Supports one or more discrete GPU~~graphic~~ or discrete compute accelerators.

(B) Supports four or more lanes of PCI-express, other than discrete GPU ~~graphics~~, connected to accessory expansion slots or ports where each lane has a bandwidth of 8 gigabits~~ytes~~ per second (Gb~~B~~/s) or more.

(C) Provides multi-processor support for two or more physically separate processor packages or sockets. This requirement cannot be met with support for a single multi-core processor.

(D) Has qualified or is currently being reviewed for qualification by two or more independent software vendor (ISV) product certifications.

…

The following documents are incorporated by reference in Section 1602.

Number	*Title*

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ADOBE SYSTEMS INCORPORATED

Adobe RGB (1998)	Adobe RGB (1998) Color Image Encoding Version 2005-05 (May 2005)

Copies available from:	Adobe Systems Incorporated Corporate Headquarters 345 Park Avenue San Jose, CA 95110-2704 (408) 536-6000 http://www.adobe.com

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EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION (ECMA)

Ecma International Standard ECMA-383 (2010)	Measuring the Energy Consumption of Personal Computing Products, 3rd edition (December 2010)
Copies available from:	ECMA International Rue du Rhone 114 – CH – 1204 Geneva Tel: +41 22 849 6000 Fax: +41 22 849 6001 http://www.ecma-international.org/publications/standards/Categories_to_be_used_with_Ecma-383.htm http://www.ecma-international.org/publications/files/ECMA-ST/ECMA-383.pdf

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INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 802.3az-2010	IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 3: CSMA/CD Access Method and Physical Layer Specifications Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet

. . .

Copies available from:	IEEE (TechStreet) Publications Office 10662 Los Vaqueros Circle PO Box 3014 Los Alamitos, CA 90720-1264 http://www.techstreet.com/ieee http://standards.ieee.org

. . .

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

. . .

IEC 60297-3-101:2004	Mechanical structures for electronic equipment – Dimensions of mechanical structures of the 482,6 mm (19 in) series – Part 3-101: Subracks and associated plug-in units
IEC 61966-2-1:1999	Multimedia systems and equipment –Colour measurement and management. Part 2-1: Colour management - Default RGB colour space - sRGB

Copies available from:	International Electrotechnical Commission 3, Rue de Varembé P.O. Box 131 CH – 1211 Geneva 20 Switzerland http://www.iec.ch Phone: +41 22 919 02 11 Fax: +41 22 919 03 00

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UNIFIED EXTENSIBLE FIRMWARE INTERFACE FORUM

Advanced Configuration and Power Interface Specification Revision 5.0 (December 6, 2011) and Advanced Configuration and Power Interface Specification Revision 5.0 Errata A (November 13, 2013)	Advanced Configuration and Power Interface Specification
Copies available from:	UEFI Forum Administration 3855 SW 153rd Drive Beaverton, OR 97003 USA http://www.uefi.org Phone: +1 503-619-0864 Fax: +1 503-644-6708

. . .

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c), 25402.5.4 and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Chapter 4 1604. Test Methods for Specific Appliances.

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

…

(2) The test method for televisions and signage displays manufactured on or after April 2, 2014 is 10 C.F.R. Sections 430.23(h) (Appendix H to Subpart B of part 430).

…

(4) The test method for computer monitors is *the ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015)*, with the following modifications:

(A) On mode measurements shall be made using the *IEC 62087: 2011* and computer monitor sleep mode and computer monitor off mode measurements shall be made using the *IEC 62301:2011*, as specified in the *ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015).*

(B) A computer monitor shall be tested as required by the test procedure ~~only~~ for each of the following:

1. On mode power draw~~consumption~~.

2. Computer monitor s~~S~~leep mode power draw ~~consumption~~.

3. Computer monitor o~~O~~ff mode power draw ~~consumption~~.

(C) Product features and functions not specifically addressed by the test method shall be turned off or disconnected. Built-in speakers shall be muted or turned down to their lowest volume setting for the on mode power ~~consumption~~draw test.

(D) Before starting the test procedure for measuring on mode power ~~consumption~~draw, any feature unrelated to the display of images (for example USB hubs, webcams, speakers, LAN connections, and SD card readers) shall be turned off.

(5) The test method for computers is the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March-2016)*, with the following modifications:

(A) Settings regarding hard-disk spinning shall not be altered from the default as-shipped settings.

(B) The total ~~power~~annual energy consumption of a computer shall be calculated using Equation 1 in Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016).*

1. Computers manufactured before July 1, 2021 shall use the "conventional" mode weighting of Table 3 for a desktop computer, a mobile gaming system, a small-scale server, a high expandability computer, or a thin client, or Table 4 for a notebook computer, a mobile workstation, or a portable all-in-one computer, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March-2016)*, unless they meet either the criteria in Section 1604(v)(5)(B)(2) to use "full capability" mode weighting, or the criteria in Section 1604(v)(5)(B)(3) to use "remote wake"~~below~~.

2. In order to use the "full capability" mode weighting a computer shall have the following features enabled as shipped:

    i. Maintain Ethernet (*IEEE 802.3-2015*) or wireless (*IEEE 802.11-2012*) network addresses and network connection capability while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode;

ii. Resume from ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode upon request from outside the local network; and

iii. Support advertising host services and network name while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode.

3. In order to use the "remote wake" mode weighting a computer shall have the following features enabled as shipped:

i. Maintain Ethernet (*IEEE 802.3-2015*) or wireless (*IEEE 802.11-2012*) network addresses and network connection capability while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode; and

ii. Resume from ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode upon request from outside the local network.

4. Computers manufactured on or after July 1, 2021, shall use the "conventional" mode weighting of Table 3 for a desktop computer, a mobile gaming system, a small-scale server, a high-expandability computer, or a thin client, or Table 4 for a notebook computer, a mobile workstation, or a portable all-in-one computer, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016).*

5. Workstations shall calculate total annual energy consumption using the weighting of Table 8, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016).*

(C) The expandability score calculation shall be included in test reports and shall be calculated as follows:

1. ~~Sum the product of~~ Identify the score for each individual interface type ~~score~~ as determined by Table V-1 and then multiply~~ied~~ by the total number of occurrences of that particular ~~such~~ interface~~s~~ type present in the system as sold or offered for sale. Finally, sum the subtotals for all interface types.

2. Each instance of an ~~individual~~ interface may only receive one score.

3. Add 100 to the score.

Table V-1
Interface Types and Scores for Expandability Score Calculation

Interface Type	*Interface Score*
USB 2.0 or less	5
USB 3.0 or 3.1 Gen 1	10

USB 3.1 Gen 2	15
USB ports or Thunderbolt 3.0 or greater that can provide 100 or more watts of power	100
USB ports or Thunderbolt 3.0 or greater that can provide ~~between~~ from 60 or more ~~and up~~ to less than 100 watts of power	60
USB ports or Thunderbolt 3.0 or greater that can provide ~~between~~ from 30 or more ~~and up~~ to less than 60 watts of power	30
Thunderbolt 3.0 or greater or USB ports that are not otherwise addressed in Table V-1 and that cannot provide 30 or more watts of power	20
Unconnected USB 2.0 motherboard header	10 per header
Unconnected USB 3.0 or 3.1 Gen 1 motherboard header	20 per header
PCI slot other than PCIe x16 (only count mechanical slots)	25
PCIe x16 or higher (only count mechanical slots)	75
Thunderbolt 2.0 or less	20
~~Thunderbolt 3.0 or greater~~	~~100~~
M.2 (except key M)	10
IDE, SATA, eSATA	15
M.2 key M, SATA express, U.2	25
Integrated liquid cooling	50
~~CPU Support for 4 channels of memory or a 256 bit or greater memory interface~~ Either: 1) CPU and motherboard support for 4 or more channels of system memory and at least 8 GB of installed and compatible system memory; or 2) At least 8 GB of system memory installed on a 256 bit or greater memory interface.	100

(D) A computer monitor used in the testing of desktop computers shall have a native resolution of at least 1920x1080 pixels and use progressive scanning. The computer operating system shall be set to operate at a minimum of 1920x1080 pixels and progressive scanning. If multiple display connections are available on the computer, choose the correct connection using the following criteria:

1. If hybrid graphics~~are~~ is available, choose the port that enables hybrid graphics.

2. If a discrete ~~graphics~~ GPU is installed, choose a connection to the ~~primary~~ first ~~discrete graphic~~ GPU, except for where it conflicts with subdivision (D)(1) of this section.

3. If no discrete ~~graphics~~ GPU is installed, choose a connection to a port integrated into the motherboard.

4. If there are multiple connector ports to choose from pursuant to ~~subdivisons~~ subdivisions (D)(1) through (D)(3) of this section, connect the display to a port using the first available from the port types listed below:

i. Display Port

ii. HDMI

iii. DVI

iv. VGA

v. Other

(E) An integrated desktop computer, mobile gaming system, or notebook computer shall be tested using the integrated display's native resolution.

(F) **~~During testing, a notebook computer, mobile gaming system, portable all-in-one, or integrated desktop shall proceed using Section 5.2(A)(1) and ignore the direction not to disable automatic brightness control as described in Section 5.2(A) of the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March 2016).* If automatic brightness control is supported and is enabled by default, position a light such that 300 lux directly enters the automatic brightness control sensor. If automatic brightness control is not enabled by default or the luminous emittance of the display is less than described in the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March 2016)* Section 5.2(E), then configure luminous emittance of the display per Section 5.2(E) of the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March 2016).*~~ High expandability computers shall be configured for the test in a manner identical to desktop computers. Mobile gaming systems and mobile workstations shall be configured for the test in a manner identical to notebook computers.**

(G) For purposes of providing data as required in Section 1606, desktop computers, thin clients, mobile gaming systems, notebook computers, and portable all-in-ones shall be tested by selecting the configuration that has the greatest allowable energy consumption as provided for in Section 1605.3(v)(5). If multiple configurations exist that meet this criteria, select the configuration that will yield the greatest annual energy consumption as measured by the test procedure.

(H) The computer sleep mode power measurement shall be tested in a modified manner from the test procedure described in *IEC 62623:2012*. Instead of measuring power after manually entering sleep mode, the power measurement shall begin no sooner than 30 minutes and no later than 31 minutes of user inactivity on the unit under test. This measurement shall ~~follow~~ be performed after the long-idle test without altering the unit under test.

(I) The power factor of a computer power supply and compliance with Table V-9 in Section 1605.3(v)(6) shall both be determined by the following test procedure: *Generalized Test Protocol for Calculating the Energy*

Efficiency of Internal Ac-Dc and Dc-Dc Power Supplies Revision 6.7 (March 1, 2014). In addition the median power factor during ~~long~~short-idle measurements shall be recorded in the test report.

…

The following documents are incorporated by reference in Section 1604.

…

Number	*Title*
. . .	
FEDERAL TEST METHODS	
. . .	
	ENERGY STAR Program Requirements for Computers, subparts Eligibility Criteria Version 6.1 (Rev. March-2016) and Final Test Method (Rev. March-2016)
	ENERGY STAR Program Requirements for Displays, subpart Final Test Method (Rev. Sep-2015)
Copies available from:	US EPA Climate Protection Partnership ENERGY STAR Programs Hotline & Distribution (MS-6202J) 1200 Pennsylvania Ave NW Washington, DC 20460 www.energystar.gov
. . .	
ECOVA	
	Generalized Test Protocol for Calculating the Energy Efficiency of Internal Ac-Dc and Dc-Dc Power Supplies Revision 6.7 (March 1, 2014)
Copies available from:	Plug Load Solutions by Ecova www.plugloadsolutions.com Phone: (971) 201-4180
. . .	
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)	
. . .	
IEEE 802.3-2015	IEEE Standard for Ethernet
IEEE 802.11-2012	IEEE Standard for Wireless LANs
Copies available from:	IEEE (TechStreet) Publications Office 10662 Los Vaqueros Circle PO Box 3014 Los Alamitos, CA 90720-1264 http://www.techstreet.com/ieee

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INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

. . .

IEC 62087: 2011	Methods of measurement for the power consumption of audio, video and related equipment
IEC 62301:2011	Household electrical appliances – Measurement of standby power
IEC 62623:2012	Desktop and notebook computers – Measurement of energy consumption
Copies available from:	International Electrotechnical Commission 3, Rue de Varembé P.O. Box 131 CH – 1211 Geneva 20 Switzerland http://www.iec.ch Phone: +41 22 919 02 11 Fax: +41 22 919 03 00

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UNIFIED EXTENSIBLE FIRMWARE INTERFACE FORUM

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. . .

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Chapter 5 1605.1. Federal and State Standards for Federally-Regulated Appliances.

…

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

See Section 1605.3(v) for energy efficiency standards for computers, computer monitors, televisions, and consumer audio and video equipment.

…

Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Chapter 6 1605.2. State Standards for Federally-Regulated Appliances.

…

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

See Section 1605.3(v) for energy efficiency standards for computers, computer monitors, televisions, and consumer audio and video equipment.

…

Chapter 7 Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c) and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

…

Chapter 8 1605.3. State Standards for Non-Federally-Regulated Appliances.

…

(v) Computers, Computer Monitors, Televisions, 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-~~1~~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-~~1~~2.

Table V-~~1~~2

Standards for Consumer Audio and Video Equipment

[Table omitted]

…

(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-~~2~~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-~~2~~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, 2011~~	~~A < 1400~~	~~1W~~	~~P ≤ 0.20 x A + 32~~	~~0.9~~
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.

~~Comply with the maximum on-mode standards in Table V-4.~~

(B) ~~Comply with at least one of the following requirements:~~

~~1. Consume less than or equal to 0.7 watt in sleep mode and less than or equal to 0.5 watt in off mode; or~~

~~2.~~ 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 ~~on, sleep, and off~~ 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
~~Resolution~~ ≤ 5.0 MP	17”≤d≤20”	[(6.0*r) + (0.025*A) + 3.7] ≛ ~~applicable adder in Table V-5~~
	20”<d<23”	[(4.2*r) + (0.02*A) + 2.2] ≛ ~~applicable adder in Table V-5~~
	23”≤d<25”	[(4.2*r) + (0.04*A) – 2.4] ≛ ~~applicable adder in Table V-5~~
	25”≤d<30”	[(4.2*r) + (0.07*A) – 10.2] ≛ ~~applicable adder in Table V-5~~
	30”≤d≤61”	[(6.0*r) + (0.1*A) – 14.5] ≛ ~~applicable adder in Table V-5~~
~~Resolution~~ > 5.0 MP	17”≤d≤20”	[25 + (0.025*A) +3.7] ≛ ~~applicable adder in Table V-5~~
	20”<d<23”	[25 + (0.02*A) +2.2] ≛ ~~applicable adder in Table V-5~~
	23”≤d<25”	[25 + (0.04*A) – 2.4] ≛ ~~applicable adder in Table V-5~~
	25”≤d<30”	[25 + (0.07*A) – 10.2] ≛ ~~applicable adder in Table V-5~~
	30”≤d≤61”	[25 + (0.1*A) – 14.5] ≛

		~~applicable adder in Table V-5~~
Where: "A" is the ~~viewable~~ monitor screen area in square inches "d" is the diagonal measurement of the display in inches "r" is the megapixel resolution of the display.		

~~(E) Manufacturers shall apply no more than one applicable adder from Table V-5 to determine the maximum on-mode wattage.~~

Table V-5
List of Potentially Applicable ~~Adders~~ 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)	~~1~~.3~~0~~ * E_{on_max}	~~1~~.2~~0~~ * 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)	~~1~~.75 * E_{on_max}	~~1~~.6~~0~~ * E_{on_max}
E_{Game}	Gaming Monitors without incremental hardware-based assistance	~~1~~.3~~0~~ * E_{on_max}	~~1~~.2~~0~~ * E_{on_max}
	Gaming Monitors with incremental hardware-based assistance	~~1~~.35 * E_{on_max}	~~1~~.3~~5~~3 * E_{on_max}
E_{OLED}	OLED monitor	~~1~~.3~~0~~* E_{on_max}	~~1~~.2~~0~~ * E_{on_max}
E_{Curve}	Curved monitor	~~1~~.3~~0~~ * E_{on_max}	~~1~~.2~~0~~ * E_{on_max}

(~~F~~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. ~~Computer monitors that are classified for use as medical devices by the United States Food and Drug Administration~~.

~~4.~~ 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:

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

ii. 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 ~~graphics~~ 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 ~~primary~~ 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 r~~R~~esolutions greater than 6 megapixels~~ shall use 6 for r~~. Before July 1, 2021 ~~On or after July 1, 2019~~: 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 ~~January~~ 1, 2021: EP=0.2 for displays with a color gamut support of 32.9% of CIELUV	8.76*0.3*(1+EP)* [(0.43*r)+(0.0263*A)] r=6 for r~~R~~esolutions greater than 6 megapixels~~ shall use 6 for r~~. 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).

	or greater (99% or more of defined sRGB colors); and EP=0.6 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).	
First Discrete ~~Graphics~~ 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 ~~Graphics~~ 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 ~~Graphics~~ GPU	11 per ~~unit~~GPU	5.5 per ~~unit~~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 ~~134~~ 146 GB/s. 3) ~~Majority of system memory capacity (in gigabytes) has a bandwidth less than 134 GB/s~~ Less than 4 GB of the system memory has a bandwidth of	22.78*tanh[0.006*(S-70)+0.15]-12.33	9.11*tanh[0.006*(S-70)+0.15]-4.45

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 ~~graphics~~ GPU.		

(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 ~~a~~ 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 ~~for Small-scale Servers, High expandability Computers, Mobile Workstations, and Workstations~~

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 ~~in quantities of 40 or fewer units of a basic model~~ shall:

(1) C~~c~~omply with the power management settings identified in Sections 1605.3(v)(5)(B)(2)~~,~~ and 1605.3(v)(6)(C)~~,and 1605.3(v)(6)(D), and are exempt from all other requirements for computers.~~;

(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 ~~40~~ 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.

…

The following documents are incorporated by reference in Section 1605.3:

Number	*Title*
…	
UNITED STATES DEPARTMENT OF ENERGY	
	International Efficiency Marking Protocol for External Power Supplies Version 3.0 (September 2013)
Copies available from:	US Department of Energy Office of Energy Efficiency and Renewable Energy, Forrestal Building, Mail Station EE-2J 1000 Independence Ave SW Washington, DC 20585-0121 202-586-5000 www.energy.gov

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Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c), 25402.5.4 and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

Chapter 9 1606. Filing by Manufacturers; Listing of Appliances in Database.

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Table X Data Submittal Requirements

	Appliance	*Required Information*	*Permissible Answers*
	All Appliances	* Manufacturer's Name	
		* Brand Name	
		* Model Number	
		Date model to be displayed	
		Regulatory Status	Federally-regulated consumer product, federally-regulated commercial and industrial equipment, non-federally-regulated

. . .

	Appliance	*Required Information*	*Permissible Answers*
V	Computer Monitors	~~Technology~~Backlight Type	~~C~~CCFL, LED, OLED, Quantum Dots
		~~Monitor Type~~	~~Computer Monitor, EPD sRGB, EPD Adobe RGB, OLED, Gaming Monitor w/ Incremental Hardware, Gaming Monitor w/o Incremental hardware, "Keyboard, Video, Mouse," "Keyboard, Mouse, Monitor," Very High Performance~~
		EPD sRGB	True, False
		EPD Adobe RGB	True, False
		OLED	True, False
		Gaming Monitor w/ Incremental Hardware	True, False
		Gaming Monitor w/o Incremental Hardware	True, False
		KVM	True, False
		KMM	True, False
		Very High Performance	True, False
		Curved Monitor	True, False
		Viewable Screen area (square inches)	
		Screen size (diagonal inches)	
		Automatic Brightness Control	True~~/~~, False
		Automatic Brightness Control Enabled when Shipped	True~~/~~, False
		Screen Luminance (Candelas Per Square Meter)	
		Native Resolution (megapixels)	
		Power ~~Consumed~~Draw in ~~Computer Monitor~~ On Mode (watts)	
		Power ~~Consumed~~Draw in Computer Monitor Sleep Mode (watts)	
		Power ~~Consumed~~Draw in Computer Monitor Off Mode (watts)	
		Touch Screen Capability	True~~/~~, False

		Touch Screen Enabled in On Mode	True, False
		Touch Screen Enabled in Computer Monitor Sleep Mode	True, False
		Touch Screen Enabled in Computer Monitor Off Mode	True, False
		Color Gamut	≥32.9% of CIELUV ~~or greater,~~ (99% or more of defined sRGB colors), ≥38.4% of CIELUV ~~or greater~~ (99% or more of defined Adobe RGB colors), ~~Less than~~ ≤32.9% of CIELUV

	Appliance	*Required Information*	*Permissible Answers*
V	Medical Computer Monitor	* Manufacturer's Name	
		* Brand Name	
		* Model Number	

Table X Continued - Data Submittal Requirements

	Appliance	*Required Information*	*Permissible Answers*
V	Computers	Computer Type	Desktop, Notebook, Small-Scale Server, Workstation, Thin Client, Portable All-In-One, Mobile Gaming System, Mobile Workstation, High Expandability Computer**, Rack-mounted Workstation**
		Operating System Type	None, Limited Capability Operating System, Other
		Operating System (Provide the operating system used during testing to calculate energy consumption.)	
		Core Speed (gigahertz)	
		Number of CPU Cores	
		CPU support for 4 or more channels of memory or a 256 bit or greater memory interface	True, False
		Number of 3.5" hard-disk drives and Others (other than ~~primary~~ main storage)	
		Number of 2.5" hard-disk drives (other than ~~primary~~ main storage)	
		Number of solid-state drives (other than ~~primary~~ main storage)	
		Number of hybrid solid-state drives (other than ~~primary~~ main storage)	
		Nameplate output power of the external power supply ~~AC Adapter Size~~ (watts) (notebook computers and mobile gaming systems only)	
		Total Battery Capacity (watt-hours) (notebook computers, portable all-in-one, and mobile gaming systems only)	
		Discrete ~~graphics processing unit(s)~~ GPU(s) present in system	True~~/~~, False
		First Discrete GPU ~~Graphics~~ Frame Buffer Bandwidth (rounded to nearest gigabyte per	

		second)	
		Total Number of Discrete GPUs ~~Graphics Processing Units~~	
		Integrated Display	True~~/~~, False
		Color Gamut (if computer has integrated display)	≥32.9% of CIELUV ~~or greater,~~ (99% or more of defined sRGB colors), ≥38.4% of CIELUV ~~or greater~~ (99% or more of defined Adobe RGB colors), ~~Less than~~ <32.9% of CIELUV
		Diagonal screen size (inches) (if computer has integrated display)	
		Viewable screen area (square inches) (if computer has integrated display)	
		Resolution (megapixels) (if computer has integrated display)	
		Enhanced Performance (if computer has integrated display)	True~~/~~, False
		Length of time of user inactivity before computer entering sleep (minutes). Do not report a number if the model does not enter sleep.	
		Length of time of user inactivity before placing display into sleep (minutes). Do not report a number if the model does not enter sleep.	
		Energy Efficient Ethernet Capability	True~~/~~, False
		Total Number of Add-in Cards	
		Video Surveillance Card	True~~/~~, False
		Wired Ethernet or Fiber Card with a transmit rate of 10 GB/s or greater	True~~/~~, False
		Total System Memory (gigabytes)	
		Highest system ~~System~~ memory bandwidth (gigabytes/second)	
		System memory with bandwidth higher than 632 GB/s (gigabytes)	
		System memory with bandwidth higher than 432 GB/s (gigabytes)	
		System memory with bandwidth higher than 146 GB/s (gigabytes)	
		System memory with bandwidth higher than 134 GB/s (gigabytes)	
		~~Sleep~~ Computer sleep mode type	ACPI S3, Other
		Computer ~~O~~off mode power (watts)	
		~~Sleep~~Computer sleep mode power (watts)	
		Long-idle power (watts)	
		Short-idle power (watts)	
		Expandability Score	
		Meets full capability mode weighting criteria	True~~/~~, False
		Meets remote wake mode weighting criteria	True, False
		Total Annual Energy Consumption (kilowatt hours per year)	
		Power Supply Meets Table V-9 or Level VI	True~~/~~, False
		Small Volume Manufacturer	True~~/~~, False
		Motherboard model number	
		Power supply type	Internal, External

		Internal power supply size (watts)	
		Power factor at full load of the computer's power supply that is not a federally regulated external power supply	
		Median power factor during short-idle of the computer's power supply that is not a federally regulated external power supply	
		Power supply model number	

…

(e) Modified and Discontinued Appliances.

…

(3) If a manufacturer of a computer fails to obtain two ISV certifications within 60 days of certifying a computer model or loses ISV certifications such that the computer model no longer meets the definition of a workstation or mobile workstation, that manufacturer shall either file to remove the appliance from the database as described in Section 1606(e)(2) or shall modify the model certification as described in Section 1606(e)(1) to comply as a different computer type.

…

(k) Small Volume Manufacturers.

(1) Entities seeking to be designated as a "small volume manufacturer" for purposes of Section 1605.3(v)(7) shall certify and retain records to demonstrate the following information:

(A) Gross revenues from the 12-month period preceding the certification, from all of the entity's operations, including operations of any other person or business entity that controls, is controlled by, or is under common control of the entity, is $2,000,000 or less; and

(B) The manufacturer assembles and sells the computers at the same location.

(2) If a small volume manufacturer no longer meets one of the requirements to be a small volume manufacturer, the entity shall file to remove itself from the database as a small volume manufacturer within 90 days.

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Note: Authority cited: Sections 25213, 25218(e), 25402(a)-25402(c) and 25960, Public Resources Code; and sections 16, 26 and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25402(a)-25402(c), 25402.5.4 and 25960, Public Resources Code; and section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).