California Energy Commission
Computers Energy Efficiency Standard Basics

August 2021

Rev 1.1

Revision History

Revision	Date	Changes
1.0	June 2021	Initial release
1.1	August 2021	• Updated Slide 5 with list of more detailed states status of what states are looking to potentially copy this regulation • Updated Slide 16, bottom right text to clarify what was meant by “Windows Power Default Settings”. Power Management needs to be enabled for Display and System Sleep times.

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WHAT IS CEC? – CALIFORNIA ENERGY COMMISSION

CEC has defined a **Mandatory** energy efficiency standard for PCs.

This is defined by CEC under their Title 20 Appliance standards

System Level requirements (Power, TEC, power management) effect all PC (in scope) sold in California; many other US states, and British Columbia (Canada) adopting CEC regulation

January 1, 2018	**TEC Exempt systems with other PM requirements go into effect**
January 1, 2019	**Tier I TEC Limits go into effect for all Computers**
Coming Soon July 1, 2021	**Tier II TEC limits go into effect for Desktop, AIO, Thin Client and Mobile Gaming Systems**

Important terms to know:

TEC (Typical Energy Consumption) Calculated annualized energy consumption (kWh) based on different power states and time in states (mode weighting)

$$E_{TEC} = \frac{8760}{1000} X (P_{OFF} X TOFF + PSLEEP X TSLEEP + PLONG_{\_IDLE} X TLONG_{\_IDLE} + PSHORT_{\_IDLE} X TSHORT_{\_IDLE})$$

ES (Expandability score) applies to PCs (except notebooks), and is a value obtained by adding up the number of interfaces multiplied by a defined interface value in the system. (example: 2 x16PCIe slots x 75 = 150 points)

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CEC Computers Standard – Official Language

- CEC – Computers Standard language is spread out into the many section of the Title 20 Appliance standard
  - https://www.energy.ca.gov/rules-and-regulations/appliance-efficiency-regulations-title-20
- Ways to read the official language
  - Original Dockets for each of the versions – look for “Final Express Terms”
    - 2016 rulemaking , 2017 rulemaking , 2020 rulemaking
  - Energy Code Ace has an easier way to read it
    - Left column under “Appliance Specific Sections Only” select “(v) Computers”
    - https://energycodeace.com/content/reference-ace-t20-tool
  - CEC does have an FAQ, but as of Q2 2021 it was taken down to have it format changed, when it is working again this document will be updated
- Contact Appliances@energy.ca.gov for any questions

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CEC Computers Regulation beyond California

- CEC Computers Regulation is not just in California
- Current list of states that have **adopted** CEC – Computers Regulation
  - Vermont – July 1, 2020
  - Washington – Jan 1, 2021
  - Colorado – Jan 1, 2021
  - Hawaii – Jan 1, 2021
  - British Columbia, Canada – July 1, 2021
  - Oregon – Jan 1, 2022
  - District of Columbia – March 15, 2022

As of August 2021

- Other states have similar bills under consideration

Passed Legislations	Bills under Review	Bills pending and inactive	Bills not being pursued
Massachusetts, Nevada	Illinois, New Jersey, Maine, North Carolina, New York, and Pennsylvania.	Connecticut, Maryland, and Texas	Rhode Island

- Key Issue: Alignment with CEC and keeping pace with CEC revisions

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CEC – Computers
TEC Limits + Adders(Allowances)

CEC Regulation Summary

- Two Tier Implementation for Desktop/ Integrated Desktop (AIO)/Thin Client/Mobile Gaming systems
  - DT/AIO/Thin Clients – (Tier 1: Jan 2019; Tier 2: July 2021)
  - Category based on Expandability Score
- Notebooks only have a Tier I TEC Limit (Jan 2019)
- TEC = Typical Energy Consumption (kWh/year)
  - TEC Equation is based on power and mode weighting, in Short Idle (Display On), Long Idle (Display Off), Sleep, and Off states
  - Expandability Score Category text is Intel added as example system types. Not included in the Standard.

From Table V-7	Expandability Score Category	Tier 1 TEC[1] Limits	Tier2 TEC[1] Limits	Units
Notebooks	One Category	30	30	kWh/yr
DT / AIO / Thin Clients / Mobile Gaming Systems	ES ≤ 250 (NUC / Mini PC)	50	50	kWh/yr
	250 < ES ≤ 425 (mainstream DT)	80 →	60	kWh/yr
	425 < ES ≤ 690 (Larger DT)	100 →	75	kWh/yr
	> 690	TEC Exempt	TEC Exempt	

[1] Typical energy consumption (kWh/year)

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TEC Limits and Measured TEC Equation

- Power measured in 4 Modes: Short Idle, Long Idle, Sleep, and Off
  - Calculated TEC (ETEC) based on measured power shall be less than or equal to maximum TEC requirement (ETEC_MAX)
    - $E_{TEC} = \frac{8760}{1000} \text{ x } (P_{OFF} \text{ X } T_{OFF} + P_{SLEEP} \text{ X } T_{SLEEP} + P_{LONG\_IDLE} \text{ X } T_{LONG\_IDLE} + P_{SHORT\_IDLE} \text{ X } T_{SHORT\_IDLE})$
  - TEC Limit (E_{TEC_MAX}) for each system is calculated by Base TEC + Additional TEC Adders
    - $E_{TEC\_MAX} = TEC_{BASE} + TEC_{MEMORY} + TEC_{EEE} + TEC_{STORAGE} + TEC_{INT\_DISPLAY} + TEC_{GRAPHICS} + TEC_{AIC} + TEC_{SYS\_MEM\_BW}$

Additional Adders

- Additional Adders: Not all adders are applicable to all systems and depends on the form factor and hardware installed
- TEC Equation Definitions:

  For systems with ACPI S3 state for Sleep
  - Short Idle: Idle with Display ON
  - Long Idle: Idle with Display OFF
  - Sleep: S3
  - Off: S5

  For systems with Alternative Sleep Mode (ie. Modern Standby)
  - Short Idle: Idle with Display ON
  - Long Idle + Sleep: Alternative Sleep Mode (i.e., Modern Standby)
  - Off: S5

TEC Mode Weightings	Desktop, AIO, Mbl Game	Notebook
T_{OFF}	45%	25%
T_{SLEEP}	5%	35%
T_{LONG_IDLE}	15%	10%
T_{SHORT_IDLE}	35%	30%

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CEC Regulation Desktop TEC Limits → Idle Power

Desktop, AIO, Mobile Gaming	ES ≤ 250	250 < ES ≤ 425 Tier I	250 < ES ≤ 425 Tier II	425 < ES ≤ 690 Tier I	425 < ES ≤ 690 Tier II
Short Idle (Watts)	12.0	19.0	14.5	23.5	18.0
Long Idle (Watts)	11.5	18.5	14.0	23.0	17.4
Sleep (Watts)	1.2	1.2	1.2	1.2	1.2
Off (Watts)	0.6	0.6	0.6	0.6	0.6
Measured TEC	**54.8**	**85.5**	**65.7**	**105.2**	**80.9**
TEC Limit (w/adders)	56.1	86.1	66.1	106.1	81.1

Notes:
- All calculations use Conventional Mode, using integrated graphics system
- Adders include 8GB of system memory and EEE adder; 6.1 kwh total adders
- For systems that use traditional S3 mode, systems using Alternative Sleep Mode would results in different power values

Example Power Values to meet each Desktop Category

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Additional TEC Adders (Table V-8)

- Based on System HW Configurations each computer will get different adders
  - System Memory
  - Energy Efficient Ethernet
  - Storage Devices – beyond the main storage devices (largest device)
  - Discrete Graphics
  - Integrated Display
  - Other Add-in Cards
  - Wired Ethernet or Fiber Card ≥10 Gb/s
  - Wired Ethernet for >1GBs to <10GB/s (2.5G & 5G LAN)
  - High Bandwidth System Memory

For exact formulas reference official language links on Slide 3

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Additional TEC Adders

Source: Tables are from Energy Code Ace website, see slide 3 for link

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 monitor 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 gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors	(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).
For a multi-screen notebook, this adder is applied for each integrated display that is enabled when shipped and shall show the same test image during testing.	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 gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).*	

First discrete GPU that is not packaged on the same substrate as the CPU (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 that is not packaged on the same substrate as the CPU (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)
First discrete GPU that is packaged on the same substrate as the CPU (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 with a transmit rate of greater than 1 Gb/s and less than 10 Gb/s that is not an Add-in card	4 per computer	0
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 GBs. 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

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CEC – Computers
Expandability Score + TEC Exemption

Expandability Score Calculation

- Expandability Score (ES) is used to place computers into different categories based on the external and internal interfaces available in the Computer.
- The ES is designed to approximate a computer's power supply demand based on the max power draw for each interface type.
- Only applies to Desktop, Integrated Desktops (AIO), Mobile Gaming Systems and Thin Clients
- The expandability score calculation :

1. Sum the product of each interface score multiplied by the number of such interfaces present in the system as sold or offered for sale.
2. Each individual interface may only receive one score.
3. Add 100 to the score.

- Note: Any future interfaces not listed here that are a revision of a listed interface will receive the previous value in the table, unless worked specifically with CEC as part of future standard revisions
- Example – Future USB not listed here would use USB 3.1 Gen 2 per port or unconnected USB 3.0 or 3.1 Gen 1 motherboard header, unless specifically worked with the CEC as part of future standard revisions

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 from 60 or more to less than 100 watts of power	60
USB ports or Thunderbolt 3.0 or greater that can provide from 30 or more 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
M.2 (except key M)	10
IDE, SATA, eSATA	15
M.2 key M, SATA express, U.2	25
Integrated liquid cooling	50
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

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Expandability Score – Sample Calculations for DT Platforms

Interface Type	Board #1 - NUC		Board #2 – mini-ITX		Board #3 - uATX		Board #4 – uATX		Board #5 – ATX		Board #6 – ATX	
	# of Ports	Score	# of Ports	Score	# of Ports	Score	# of Ports	Score	# of Ports	Score	# of Ports	Score
USB2.0			4	20	4	20			4	20	2	10
USB3.0	3	30	2	20	2	20	6	60	4	40	6	60
USB3.1 (Gen2)											2	30
USB 2.0 MB Hdr	2	20	2	20	1	10	1	10	2	20	1	10
USB 3.0 MB Hdr			1	20	1	10	1	20	2	40	1	20
USB Charging	1	20										
PCIe x16			1	75	1	75	2	150	2	150	4	300
PCIe (< x16)					2	50	2	50	4	100	2	50
SATA, eSATA	1	15	4	60	4	60	6	90	6	90	6	90
M.2 (except Key M)	1	10	1	10							1	10
M.2 Key M, SATA Express							1	25	4	100	4	100
TBT2												
Factor	--	100	--	100	--	100	--	100	--	100	--	100
Total	--	195	--	325	--	355	--	505	--	660	--	780

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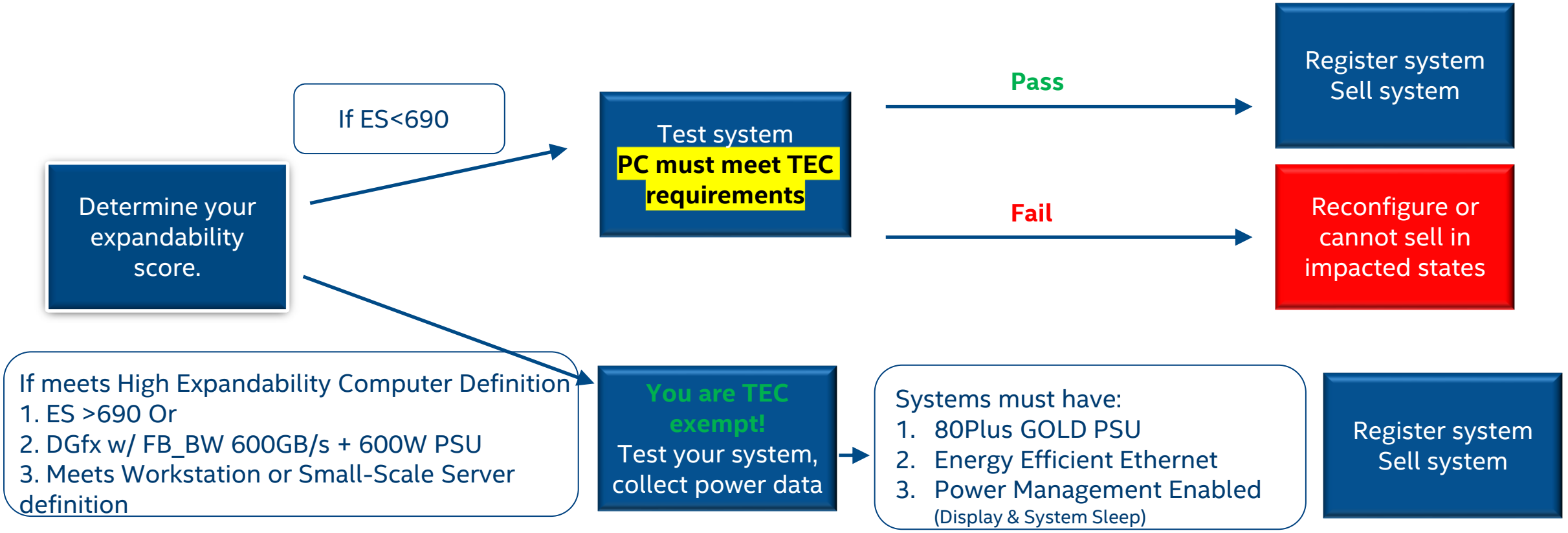
OEM Guidelines

WHAT DO YOU NEED TO DO FOR COMPLIANCE?

1. OEMS are responsible for categorizing, testing, and registering PC products shipped into impacted states.
2. OEMs must used a registered test lab to collect power data. They can get systems tested in existing CEC labs today (including the Intel ADC lab), or build and certify their own lab.



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Product Family/Basic Model Definition

- Every Product Family will need a Test Report and be Registered
  - Even TEC Exempt computers require a Test Report and Registration
- Product Family (Basic Model) = Chassis, Motherboard, and PSU combination by a single manufacturer
  - Slight changes to the Chassis are allowed, defined by no change in energy use, i.e. color or bezel changes are allowed
- Testing for Product Family/Basic Model
  - Report data for highest power configuration
  - All shipping configurations still must meet TEC Requirements
    - TEC limit can changed based on components added to the computer

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Registering Product with the CEC

- The MAEDBS Database is how systems get registered for the CEC Computer Regulations. All computers sold in CA must be registered by the effective date
  - General MAEDBS Information - http://www.energy.ca.gov/appliances/forms/MAEDBS_General_Instructions.pdf
- Data can be entered by the Manufacturer, Test Lab, or 3rd Party Certifier
  - The manufacturer needs to fill out "Delegation of Authority Application" if they are not submitting their own information
- Data can be entered in 2 ways
  1. Manual – One system at a time – using webpage entry
  2. Upload Excel – Batch system load, can load multiple systems at one time in a pre loaded spreadsheet, up to 1000 systems at a time. Templates are expected to be available.

MAEDBS Database - https://cacertappliances.energy.ca.gov/Login.aspx

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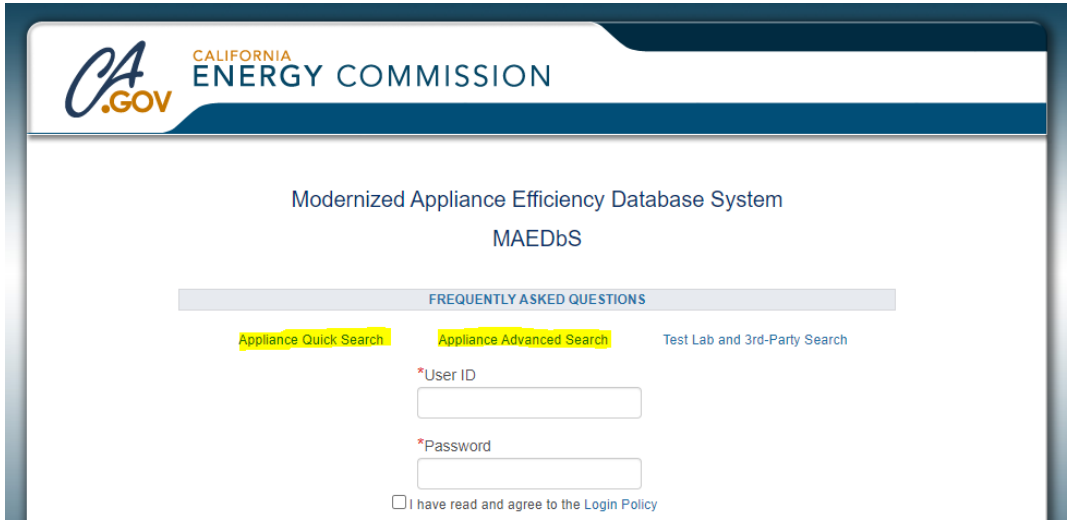
Registration and Markings of Computers

- There is no Mark Required for computers to show they meet CEC-Computers
  - Computer needs to be labeled with: (1) manufacturer name, (2) brand name, or trademark; (3) model number; and (4) date of manufacture.
    - This information needs to be the same way it is listed in the MAEDBS database
- MAEDBS database is public and can be searched by manufacturer and model number or to look for Test Labs
  - Use Quick Search or Advanced Search
  - https://cacertappliances.energy.ca.gov/Login.aspx



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CEC Title 20 Enforcement

CEC Title 20 Enforcement

- CEC has its own Enforcement department for all appliances
  - https://www.energy.ca.gov/about/divisions-and-offices/office-compliance-assistance-and-enforcement
  - If you click on Enforcement Case Settlements Database you can see the various penalties that have been imposed through the years.
- Enforcement matters are covered under section 1608 of Title-20: Compliance, Enforcement, and General Administrative Matters. Here is the link to it:
  - https://govt.westlaw.com/calregs/Document/I2C4FAEBD062349179E16F6791E6B5ED0?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)&bhcp=1
- The maximum fine is $2500 per violation, and each unit sold is a violation. Section 1609 of the regulations talks about penalties.
  - https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I8F8F3BC0D44E11DEA95CA4428EC25FA0&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)
  - Fine is listed @ this link: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=25402.11.&lawCode=PRC

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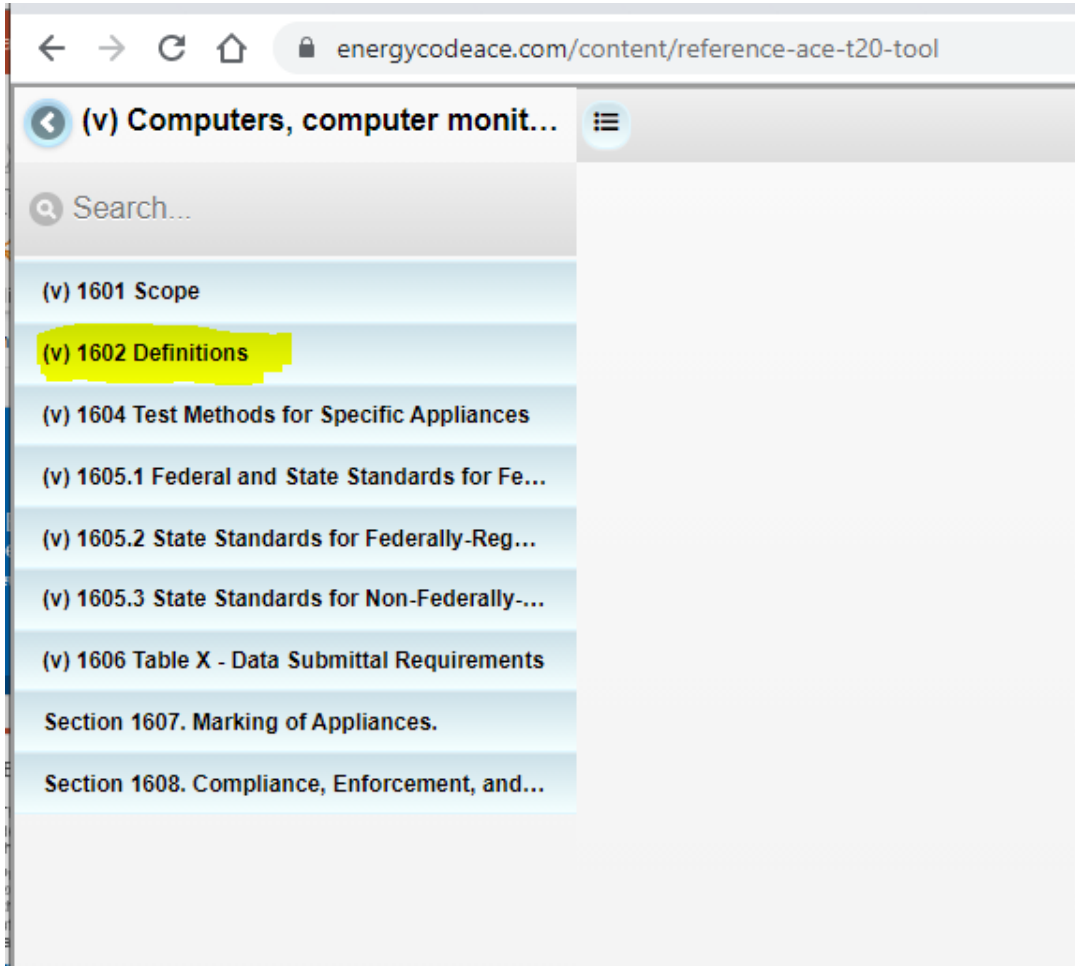
CEC Computers Standard Key Definitions

Details provided for Reference Information

CEC Computers Standard Key Definitions

- The following slides have key definitions copied directly from the CEC Computers Standard.
- Product Definitions are not expected to be updated or changed, but reference the official websites for actual language:
- Definitions are in Section 1602 of the Title 20 Standard

https://energycodeace.com/content/reference-ace-t20-tool



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CEC Definitions – Text directly from the Standard

- "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.

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CEC Definitions – Text directly from the Standard

- "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.
- "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.
- "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.

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CEC Definitions – Text directly from the Standard

- "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.

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

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CEC Definitions – Text directly from the Standard

- "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.
- "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.

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CEC Definitions – Text directly from the Standard

- "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:
    1. Supports one or more discrete GPU graphic or discrete compute accelerators.
    2. 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 per second (Gb/s) or more.
    3. 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.
    4. Has qualified or is currently being reviewed for qualification by two or more independent software vendor (ISV) product certifications.

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CEC Definitions – Text directly from the Standard

- "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. Supports either:
   a) At least one integrated or discrete GPU graphics processing unit with frame buffer bandwidth of 134 96 gigabytes per second or greater; or
   b) 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.

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CEC Definitions – Text directly from the Standard

- **"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).

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CEC Definitions – Text directly from the Standard

- **"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.

Industrial Computers are exempt from the regulation

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CEC Definitions – Text directly from the Standard

- "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.
- "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.

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CEC Definitions – Text directly from the Standard

- **“Limited capability operating system”** means an operating system that performs basic operations and that meets all of the following criteria does not:

1. Does not have automatic power management features;
2. Does not support USB devices;
3. Does not have a Graphical User Interface (GUI); and
4. Does not support multiple user profiles or distinguish between users.

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CEC Definitions – Text directly from the Standard

- "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).

Small Volume Manufacture is exempt from this Standard

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Alternative to Sleep mode power limits (Table V-6)

Table is directly copied from the regulation

- If the computer system uses an Alternative Sleep Mode (ie. Modern Standby), then this modal power requirement is applicable:

Computer Type	Maximum Power	Note
Workstations, Mobile Workstations, High Expandability Computers, Small-Scale Server	10 + 0.03 * C	Where C is the system memory capacity in GB minus 32 GB. If C is less than zero, use zero for the value of C
Desktop Computers, Integrated Desktops (AIO), Thin Clients, and Mobile Gaming Systems	5 + 0.03 * C	
Notebook Computers and Portable All-In-Ones	2.5 + 0.03 * C – no Discrete GPU 4.5 + 0.03 * C – with Discrete GPU	Where C is the system memory capacity in GB minus 16 GB. If C is less than zero, use zero for the value of C

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CEC Definitions – Text directly from the Standard

- "Idle condition" means an active state of a computer where no user interaction is occurring and where no user prescribed task is underway.
- "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).
- "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.
- "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.
- "Computer off mode" means an ACPI System Level S5 state.

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CEC Definitions – Text directly from the Standard

- "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*.

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