DOCKETED

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ITI & TechNet Concerns
CEC Computers/Displays
August 10, 2016

DISCRETE GPU DEFINITION

Problem statement overview

Problem Statement: language was added to the definition of discrete GPUs (dGPUs): in the 15-Day Express Terms :

"Discrete GPUs are not packaged on the same die or substrate as the CPU."

This added language regulates packaging design of discrete GPUs and is not based on presence of dGPU, or its energy/performance characteristics, Harms future product innovation & Ca. competitiveness.

Background:

Definition of dGPUs in 45-Day language *"Discrete Graphics" or "Discrete Graphics GPU" means a graphics processing unit (GPU) with a local memory controller interface and local graphics-specific memory."* is used by ENERGY STAR and other computer regulations

- Based on distinguishing characteristics of dGPUs from integrated graphics, i.e, inclusion of local memory controller interface and local graphics specific memory.

- The added text in definition of dGPUs in 15-Day language: *"Discrete GPUs are not packaged on the same die or substrate as the CPU."* would result in unintended consequences. Definition is important because the computer standard classifies products and provides adders based on presence dGPUs.

Problem statement overview

Background (Cont'd):

- Using dGPU definition that was in 45-day language will not change expected energy savings of standard. Energy savings are based on 45 Day language.
- Packaging text added to definition in 15-Day language creates unintended negative consequences:
  - **Arbitrary distinction, based on packaging design rather than presence of dGPUs**
  - **Creates limits on future discrete graphics product innovation and competition**
  - **Limits choices for computer manufacturers**, i.e. only discrete graphics that are separately packaged from CPUs would be able to qualify for the CA. market because of the discrete GPU "adder"
  - **Potential loss of consumer choice** based on inability certain new computer products to qualify for California market, compared to other states and countries
  - **Potential loss of environmental benefits:** miniaturization of devices is associated with providing greater functionality in smaller form factors. Multi-chip packaging also results in reduced manufacturing impacts

Objective and Approach

(return to definition of dGPU in 45-Day language which allows an adequate adder)

Objectives

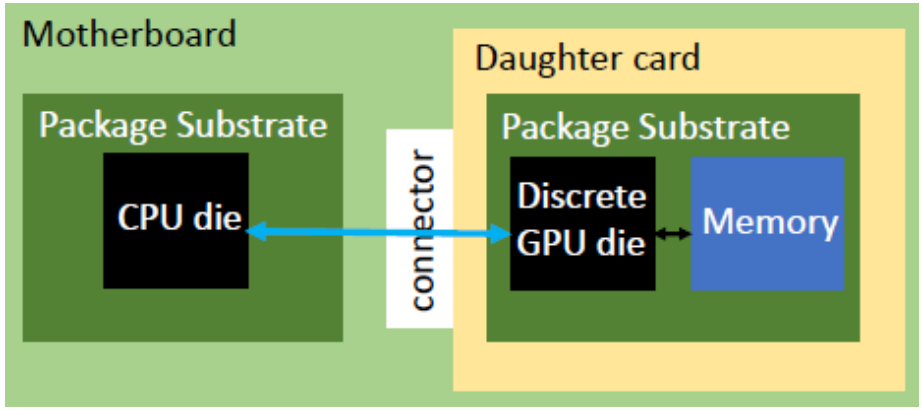
- No change to energy savings expected from standard
- Treat as high priority
- Harmonize with ENERGY STAR, international practice
- Remove limits to future product packaging design options for dGPUs
- Allow for future innovation, competitive products on CA market
- Provide consistency in adder approach (same dGPU adder across various packaging design options)

Approach

- Allow same adder approach as used for current dGPU adders (given similar dGPU power consumption in idle)
- Use definition dGPUs that's in 45-day language

15-day Language Impacts Innovation

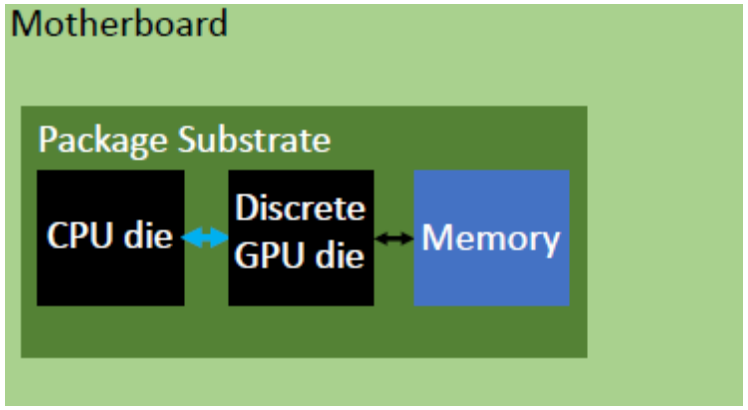
- Limits future dGPU and computer designs
  - Restricts future packaging options in CA; prevents multi-chip packaging, and system on chip designs using a CPU and discrete GPU
  - Example: 15-day language limits dGPU adders to traditional packaging option
    - dGPUs in examples shown below have similar performance & power



Traditional packaging example

15-day language: allowed on CA. market

45-day language: allowed on CA. market



Multi-chip module example

15-day language: cannot be placed on CA. market

45-day language; allowed on Ca. market

Using existing high bandwidth system memory adder is not an option

- Memory associated with a Discrete GPU on same package as CPU is not system memory.
- CPU on the same package as a discrete GPU likely has less than 146GB/s of system memory bandwidth.
- The adders for high bandwidth system memory are not sufficient or designed for this purpose.

MOBILE GAMING SYSTEM DEFINITION

Mobile Gaming System Definition

Industry recommends the following clarification to item (4) in the Mobile Gaming System definition:

- "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) 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 of 150 watts or greater; and

(4) Total battery capacity of ~~90~~ **68** watt-hours or greater.

The ask is to only change the Battery size to Better reflect true Market Conditions

Initial Comments

- According to ITI member company data, 99 watt hours is the largest available for sale with notebooks (battery air shipment restrictions).
- Most Gaming notebooks have battery sizes from 43 – 99 WH
  - 68 WH is not covering all Gaming Notebooks,
  - But does allow the intended "larger" Gaming Notebooks to be classified as a Mobile Gaming Systems.
- Summary of Battery Sizes in the market (Q2 2017)

Type of device	Majority of market Battery size
Tablets	13 - 25 WH
2-in-1 Detachable	16 - 42 WH
2-in-1 Convertible	24 - 56 WH
Thin & Light Notebook	33 - 60 WH
Mainstream Notebook	30 – 66 WH
Premium Notebooks	37 – 79 WH
Gaming Notebook	43 – 99 WH

68 WH is better limit to be partnered with the other 3 requirements
to let a product be classified as Mobile Gaming System.

Notebooks shown to CEC in July 2016

- Below is a list of Notebooks shown at a CEC Face to Face meeting in July 2016 to demonstrate that Mobile Gaming Products are different from other mainstream notebooks

  None of those have a battery size larger than 90 WH

Manufacturer & Model #	Type of Computer	Battery Size
MSI GT72S 6QE	Thick Gaming Notebook	83 WH
CyberPower Fangbook 4 Extreme G-Sync 200	Thick Gaming Notebook	75 WH
CyberPower Fangbook 4 Xtreme SX-L 300	Thick Gaming Notebook with Full Size Keyboard	75 WH
Lenovo Y700	Thin Gaming Option	60 WH
Samsung ATIV Book 9 Pro-001	Thin Gaming Option	57 WH

These 3 were the examples of Notebooks that should be in the Mobile Gaming Product Definition

Notebooks shown to CEC in July 2016

- Detail Data

Manufacturer & Model #	Battery Size	Memory size	GPU FB_BW	EPS Rating	Meets all 4 criteria	Base TEC (measured – TEC adders)	Short Idle (watts)
MSI GT72S 6QE	83 WH	32	160.4	230	yes	76.3	34.7
CyberPower Fangbook 4 Extreme G-Sync 200	75 WH	16	120.3	230	no	53.4	28.1
CyberPower Fangbook 4 Xtreme SX-L 300	75 WH	16	160 (x2)	330	Yes	94.3	39.5
Lenovo Y700	60 WH	16	80	135	No	30.9	12.9
Samsung ATIV Book 9 Pro-001	57 WH	8	80	90	No	12.2	9.8

Summary of Gaming Notebooks-1

List on this page shows notebooks that are above or close to the battery size of 68 WH, plus the other attributes in the Mobile Gaming System definition.

Summary:

- Mobile Gaming System definition works because of all 4 attributes.
- Battery size is important but not only factor
- Battery size needs to be appropriate for Gaming Notebooks

Battery Size	Memory size	GPU FB_BW	EPS Rating	Meets all 4 criteria	Base TEC (measured – TEC adders)
95	16	112	150	No	29.5
79.2	8,12,**16**	32	90	No	<0
74	8	80	130	No	5.0
84	32	80	130	No	15
76	16	160	180	Yes	39.6
78	Up to 16	Int G. only	40	No	
60	16	80	135	No	30.9
85	32	160	230	Yes	76.3
67	16	120	180	No	24.1
96	16, 32, 64	256	230	Yes	
90	16, 32, 64	256	230	Yes	
76	32	192	180	Yes	

Does Not include any Mobile Workstation systems

Summary of Gaming Notebooks-2

List on this page shows notebooks that are above or close to the battery size of 68 WH, plus the other attributes in the Mobile Gaming System definition.

Gaming Notebooks that meet Original Definition = 19%

Gaming Notebooks that meet new Mbl Gaming Sys = 58%

Summary:

- Mobile Gaming System definition works because of all 4 attributes.
- Battery size is important but not only factor
- Battery size needs to be appropriate for Gaming Notebooks

Battery Size	Memory size	GPU FB_BW	EPS Rating	Meets all 4 criteria	Base TEC (measured – TEC adders)
99	32	160	240	Yes	114.7
83	16	160x2	330	Yes	94.3
75	16	120.3	230	No	53.4
68	16	160	180	Yes	39.4
69	16	80	130	No	36.6
72	16	120	180	No	
99	32	320	250	Yes	
70	16	120	165	No	27.4
75	32	320	300	Yes	56.5
93	16,32,64	320	150+	Yes	
88	32	160	230	Yes	
71	16,32,64	320	330	Yes	
76	32	256	230	Yes	
76	36	192	180	Yes	

Does Not include any Mobile Workstation systems

MAEDBS Data Analysis for Battery Size

	Sort 1 – Any PC + Tablet	Sort 2 – PCs, All Years	Sort 3 – PCs, 2015-17	Sort 4 – PCs, 2016-17
Total Count	2090	864	697	451
Count >=68	411	409	287	71
Percentage	19.7%	47.3%	41.2%	15.7%
Average	33.9 WH	58.5 WH	56.3 WH	47.9 WH

Battery Sizes are getting smaller from 2013 to 2016/17

Details about Sorts

- **Sort 1 includes Product Types**: 2in1 Notebook, Computer, Internet Tablet, Laptop, Laptop Computer, Laptopcomputer, Netbook, Notebook, Notebook Computer, Notebook PC, Portable Computer, Portable Computer – Tablet, Portable Tablet Computer, Portalble Tablet Computer, Tablet, Tablet Computer, Tablet PC, Thin client, Ttablet PC
- **Sort 2 Includes Product Types:** 2in1 Notebook, Computer, Laptop, Laptop Computer, Laptopcomputer, Netbook, Notebook, Notebook Computer, Notebook PC, Portable Computer, Thin client
- **Sort 3** Includes Sort 2 Product Types, then Product Years 2015-2017
- **Sort 4** Includes Sort 2 Product Types, then Product Years 2016-2017

Current Market data for battery Sizes

- The next slides show detail data from many different Notebook vendors to show what the battery size is across all different types of Notebooks
  - Specific models over 68 WHs are called out
    - This does not mean that all of the models listed meet the other 3 criteria for Mobile Gaming Systems in the CEC definition
- Vendor data included
  - HP, Dell, Lenovo, MSI, Asus, Acer, Razor, Samsung, EVGA, Generic White Box
- Some vendors were chosen because they specialize in Gaming Notebooks
  - Data shows that even the vendors with all Gaming Notebooks, not all of their products would meet the 68 WH limit

HP Data

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
Omen	Gaming Brand	61.5, 62, 63, 95	OMEN by HP - 17-w252nr – 95 OMEN Laptop - 17t gaming - 95
Spectre x360	Premium brand	57.8, 79.2	HP Spectre x360 Convertible Laptop - 15t touch – 79.2
Spectre	Premium brand	38	
Spectre x2	Our thinnest detachable	42	
Envy 13,15,17, x360	Premium – Thin & Light	41, 43, 48, 52, 55, 57.8	
Pavilion, x360	Standard, Convertible	34, 41, 48	
Chromebook	Standard	37, 43, 45	
EliteBook - x360, Revolve, Folio	Standard, Detachable, Business	38, 44, 45, 46, 51, 57	
HP Laptop	Standard	31, 41	
Stream	Standard	37	
ProBook, x360	Standard, Business	41, 44, 48, 55	
Elite x2	Detachable, Business	40	
HP Pro x2	Detachable	41	
Mobile Thin Client	Business	51	
Zbook Mobile WS	Business, Workstation	46, 51, 64, 96	HP ZBook 17 G3 Mobile Workstation – 96 HP ZBook 17 G4 Mobile Workstation - 96

Dell Data

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
Inspiron – 3000, 5000, 7000	For home and home office	32, 40, 42, 56	
Inspiron 5000 & 7000 Gaming Series	Gaming Series	74	Inspiron 15 7000 Gaming – 74 Inspiron 15 5000 Gaming - 74
XPS – 13, 13 2-in-1	Designed to be the best	46, 56, 60,	
XPS 15, XPS 15 Touch		84, 97	Both models - 97
Alienware – 13, 15, 17	For high-performance gaming	68, 76, 99	Alienware 13 – 76 Alienware 15 – 68, 99 Alienware 17 – 68, 99
Chromebook	For fast access to the web	42, 56	
Latitude – 3000, 5000, 7000	For business	40, 42, 65	
Latitude – Education, Rugged		26, 50, 56, 58, 65, 87, 97	Latitude 14 Rugged – 58, 65, 87, 97 Latitude 14 Rugged Extreme – 58, 65, 87, 97
Precision Mobile WS	Mobile Workstation	68, 72, 88, 91, 92	All Models – Mobile WS

Lenovo Data

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
Thinkpad – X, T,	THIN & LIGHTWEIGHT ULTRABOOKS	(23x2), (23+26), (24x2), 32+24, 52, 56, 57, optional 72 WH	
P	MOBILE WORKSTATIONS	24, 48, 53, 66, 72, 90, 96	P71 Mobile Workstation – 96 P51 Mobile Workstation – 90 ThinkPad P51s Mobile Workstation – 32, 48, 72
Yoga,	2-IN-1 BUSINESS ULTRABOOKS	44, 51, 53, 56	
E, L,	AFFORDABLE SMALL BUSINESS LAPTOPS	(23x2), 41, 45, 48	
13, 11E	RUGGED & Student LAPTOPS	42	
Ideapad – 100, 300, 500, 700,	SLEEK BUILD, ALL-PURPOSE ABILITY	24, 30, 32, 35, 39, 46	
Y700	SOLID GAMING NOTEBOOKS	45, 60 WH	
Flex Series	AFFORDABLE, ALL-PURPOSE 2-IN-1S	45, 52.5	
Legion Y	SERIOUS GAMING LAPTOPS	45, 60 WH	
Yoga 900, 700	Convertibles	40, 53, 78	Yoga 910 14” – 78 – no discrete Graphics
N Series	Chromebook	44, 45 WH	

MSI Data

MSI – Leader in Gaming Notebooks

- Voted #1 for Best Gaming Brand by PC Magazine Readers 2017

Series Name	Marketing Description	Battery Size (WH)
GT	Powerhouse, Extreme Performance	75, 83 WH
GS	Slim, Fast, Charming	57, 61, 65 WH
GE	Enthusiast, Power, Tough	51 WH
GP	Thin & Light	41 WH
GL	Mainstream, Capacity, Reliability	(6 cell)

A Leader in Gaming Notebooks, and only 1 product line would be larger than 68 WH

Asus Data

Asus – Large variety of Notebooks

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
ZenBook Series	Thin and light product	40, 46, 48, 50, 54, 57, 60, 96 WH	ASUS ZenBook Pro UX501VW – 60, 96
Republic of Gamers	Gaming line of notebooks	48, 62, 64, 67, 71, 76, 88, 90, 93, 96 WH	ROG G752VS OC Edition (7th Gen Intel Core) – 96 ROG GX800VH (7th Gen Intel Core) – 71 ROG GL702VM (7th Gen Intel Core) – 76 ROG G701VI (7th Gen Intel Core) – 93 ROG GL702VS – 76 ROG G701VI – 93 ROG GL702VM – 76 G752VS OC Edition – 90 ROG G752VS – 90 ROG G701VO – 93 ROG G752VY - 88
K Series	Stay cool with metallic Chic	48 WH	
X Series	15.6” HD Display – Metallic	37 WH	
Chromebooks		31, 38, 39, 48 WH	
E Series	Mobile Performance, Elegantly Crafted	32, 38, 57 WH	
Q Series	Convertibles	(other smaller), 50 WH	
B Series	Business, Workstation	37, 48, 56, 72, 87 WH	ASUSPRO P2440UQ - 72 ASUSPRO P2430UA – 37, 56, 87 ASUSPRO P2530UA – 37, 56, 87
F Series	Classic Design	37 WH	
Convertible 2-in-1	Transformer Book Flip	38 WH	
Detachable 2-in-1	Transformer	31, 39 WH	

Gaming Line should have the most to meet the Mobile Gaming Definition, but not all are larger than 68 WH

Acer Data

Acer – Large variety of Notebooks

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
Spin 3	Convertible and Convenient for a Modern Lifestyle	3.22 AH = 38.6wH*	
Spin 5	A small adjustment, a big difference.	3.22 AH = 38.6wH*	
Spin 7	Thin. Light. Exquisite.	2.77 AH = 33 WH*	
Swift 7	A Laptop of Ultra-thin Proportions	2.77 AH = 33 WH*	
Predator	Gaming Line	6 AH = 72 WH*	All Predator 15, 17, 21
Chromebook		3.92 AH = 47 WH*	
Travel Mate P6	Business Line	4.8 AH = 57.6 WH*	
Swift 1	Basic Business Line	4.92 AH = 59 WH*	
		*Battery size listed on website is in mAH, to conver to WH used the assumption of 12V	

Only the Gaming Brand from Acer would meet

Razor Data

Razor – Gaming Notebooks

Another Notebook company that specializes in gaming notebooks and not all of these would meet the 68 WH limit

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
Blade Stealth	The Ultimate Ultrabook™	53.6 WH	
Blade Pro	The Desktop In Your Laptop	99 WH	ALL
Blade	POWERFUL. PORTABLE. PERFECT.	70 WH	ALL

Samsung Data

Samsung – full range of notebooks

Series Name	Marketing Description	Battery Size (Wh)	Types over 68 WH
Notebook Odyssey	Packed with power - Gaming	43 WH	
Notebook 9 15.6”	Slim. Light. Versatile.	66 WH	
Notebook 9 13.3”	Slim. Light. Versatile.	30 WH	
Notebook 9 Pro	Powered To Perform	57 WH	
Notebook 7 Spin	Multimedia Performance	45 WH	
Notebook 9 spin	360º Rotating Hinge	39 WH	
Notebook 5	In touch with your world	43 WH	
Notebook 9 15”	Thin & Light	39 WH	
Notebook 3	Experience better viewing.	43 WH	
Notebook M 11.6”	Great design inside and out	30 WH	

EVGA

EVGA –

- Big gaming brand for components – PSU, Graphics Cards, motherboards, and gaming accessories.
- They are new to making complete notebooks for Gaming

Series Name	Marketing Description	Battery Size (Wh)
SC17	17”, 4K Display	74.8
SC15	15”	66.12

General Notebook - CTE

- Data Source – White Box Notebooks

Type of device	Majority of market Battery size
Tablets	13 - 25 WH
2-in-1 Detachable	16 - 37 WH
2-in-1 Convertible	29 - 37 WH
Ultra Slim Notebook	37 - 56 WH
Mainstream Notebook	35 – 62 WH
Gaming Notebook	51 – 89 WH

Not all Gaming Notebooks would meet the >68 WH criteria

MOBILE WORKSTATION DEFINITION

Mobile Workstation Definition

Industry recommends the following clarification to item (3) in the Mobile Workstation definition:

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**~~ **Supports** either:

(i) At least one discrete GPU with frame buffer bandwidth of 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.

Justification

There are multiple reasons for this recommendation:

1. Due to the engineering hours and difficulty of obtaining ISV certifications there is no risk that commercial notebooks will be incorrectly added to the Mobile Workstation category.

2. All Mobile Workstations can claim *support* of 96 GB/s frame buffer bandwidth but not every California customer orders a configuration that *has* a discrete graphics card.

3. Category definition criteria are based on the fundamental model capability. *Supports* indicates the fundamental model capability rather than specific configuration capability. Using *has* establishes a configuration dependent criteria which is inconsistent with the Desktop Workstation definition criteria.

4. Industry will propose the same Mobile Workstation definition change to the EU during the ErP review process taking place this fall. Harmonizing around the changed definition is beneficial for both regulators and industry.

5. Integrated GPU's with 134 GB/s memory bandwidth will not be implemented on Mobile Workstations by 1 January 2018 due to availability.

6. Commercial Mobile Workstation California customers will be limited in the configurations that they can order because the product does not meet the current Mobile Workstation definition and does not meet the Notebook TEC limit.

7. The recommended change will not negatively affect the CEC's total energy savings projections because the Mobile Workstation category is already exempt from the TEC limits.

(3) Has either:

(i) At least one discrete GPU with frame buffer bandwidth of 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

Mobile Workstation Models	discrete GPU frame buffer bandwidth >= 96GB/s	integrated GPU w/bandwidth >= 134GB/s	CEC Classification
A		N	Notebook
	N		Notebook
B		N	Notebook
	Y		Mobile Workstation
C		N	Notebook
	N		Notebook
D		N	Notebook
	N		Notebook
E		N	Notebook
	N		Notebook
	N		Notebook
	Y		Mobile Workstation
	Y		Mobile Workstation
F		N	Notebook
	N		Notebook
	Y		Mobile Workstation
	Y		Mobile Workstation
	Y		Mobile Workstation
	Y		Mobile Workstation
	Y		Mobile Workstation
G		N	Notebook
	Y		Mobile Workstation
	Y		Mobile Workstation
H		N	Notebook
	Y		Mobile Workstation
	Y		Mobile Workstation
	Y		Mobile Workstation