Energy Star for Computers 6 – Battery Charger System and Graphics Efficiency

Stakeholder Meeting, March 10, 2011

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Agenda

1. Battery charger system efficiency for notebooks and tablets
2. Discrete graphics

Include battery charger system in computer spec

Notebook battery charger system 24-hr efficiency varies broadly:

ID	Type	24h Efficiency (%)
BC284	Laptop	69%
BC286	Netbook	55%
BC297	Netbook	44%
BC302	Laptop	33%

Source: PG&E, tested in ECOS laboratory

Battery charger system accounts for a significant part of notebook annual energy use:

	CSL 0 (kWh)	CSL 1 (kWh)	CSL 2 (kWh)
DOE - Manufacturer Data	32.9	10.0	6.2
DOE - Test and Teardowns	45.5	11.6	5.7

Source: DOE

For reference:

Energy Star 5 Notebook	Base TEC (kWh)
Cat A	40
Cat B	53
Cat C	88.5

CSLs: DOE Candidate Standard Levels.
CSL0: Bottom of Market; CSL1: Mid-Market; CSL2: Best in Market

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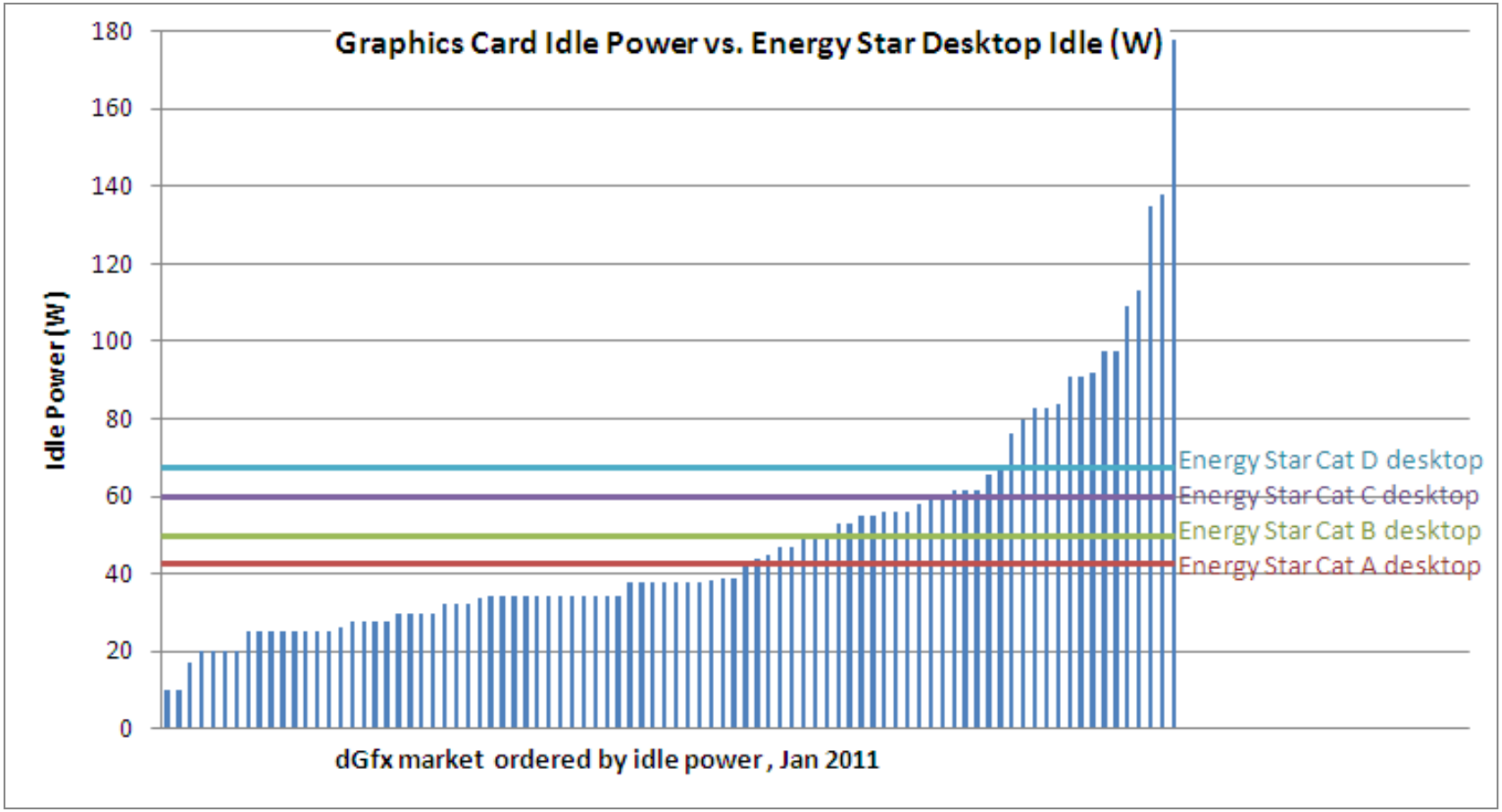
Discrete graphics idle power represents 25%-300% of Energy Star 5 idle power budget



Source: NRDC research based on 3rd-party data such as Tom's Hardware

E* 5 capability adjustments not adequate for majority of desktop discrete graphics

Energy Star 5 Capability Adjustments:

Capability	Desktop			Notebook
Premium Graphics (for discrete GPUs with specified Frame Buffer Widths)	Cat A,B	35 kWh (FBW <= 128-bit) 50 kWh (FBW > 128-bit)	(10W) (14W)	Cat B: 3kWh (FBW > 64-bit)
	Cat C,D	50 kWh (FBW > 128-bit)	(14W)	

- ES5 allowances lower than idle power of best discrete graphics on the market today
- Results in very few desktops with discrete graphics qualified
- To increase Energy Star adoption in desktops, ES6 needs to allow desktops with the most energy efficient discrete graphics to qualify

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Focus on discrete graphics

GPU shipments (million units)

	World		
2010	**Desktop**	**Laptop**	**Total**
Integrated	194.5	155.8	**350**
Discrete	74.8	59.9	**135**
Total	**269**	**216**	**485**

- Discrete graphics not a niche: still many desktops shipped with discrete graphics, especially consumer desktops

Source: Mercury Research, Jon Peddie Research

Discrete graphics responsible for est. 18% of desktop energy use

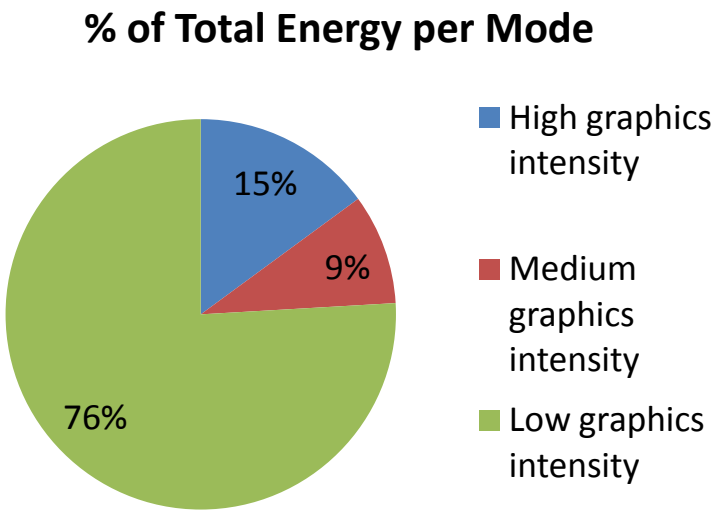
	US Stock (million)	US Annual Energy Consumption (TWh)
Desktop PCs	155	59.8
Discrete desktop graphics cards	65.9	10.8
		18%

Source: NRDC analysis, 2010

Most video card energy use spent in idle or low graphics modes (aka “2D”)

Only a few PC applications require high graphics (“3D”) processing:

Mode		Graphics intensity
Idle		Low
Internet	Browsing, Social Networking…	Low
Email		Low
Office	Documents, Spreadsheets, Presentations	Low
Media playback	SD Optical Disk (DVD), Video Streaming	Low
	High-Def (Blu-Ray)	Medium
Gaming	SD Games	Medium
	High-Def Games	High
3D biz apps	CAD, Video Editing…	High



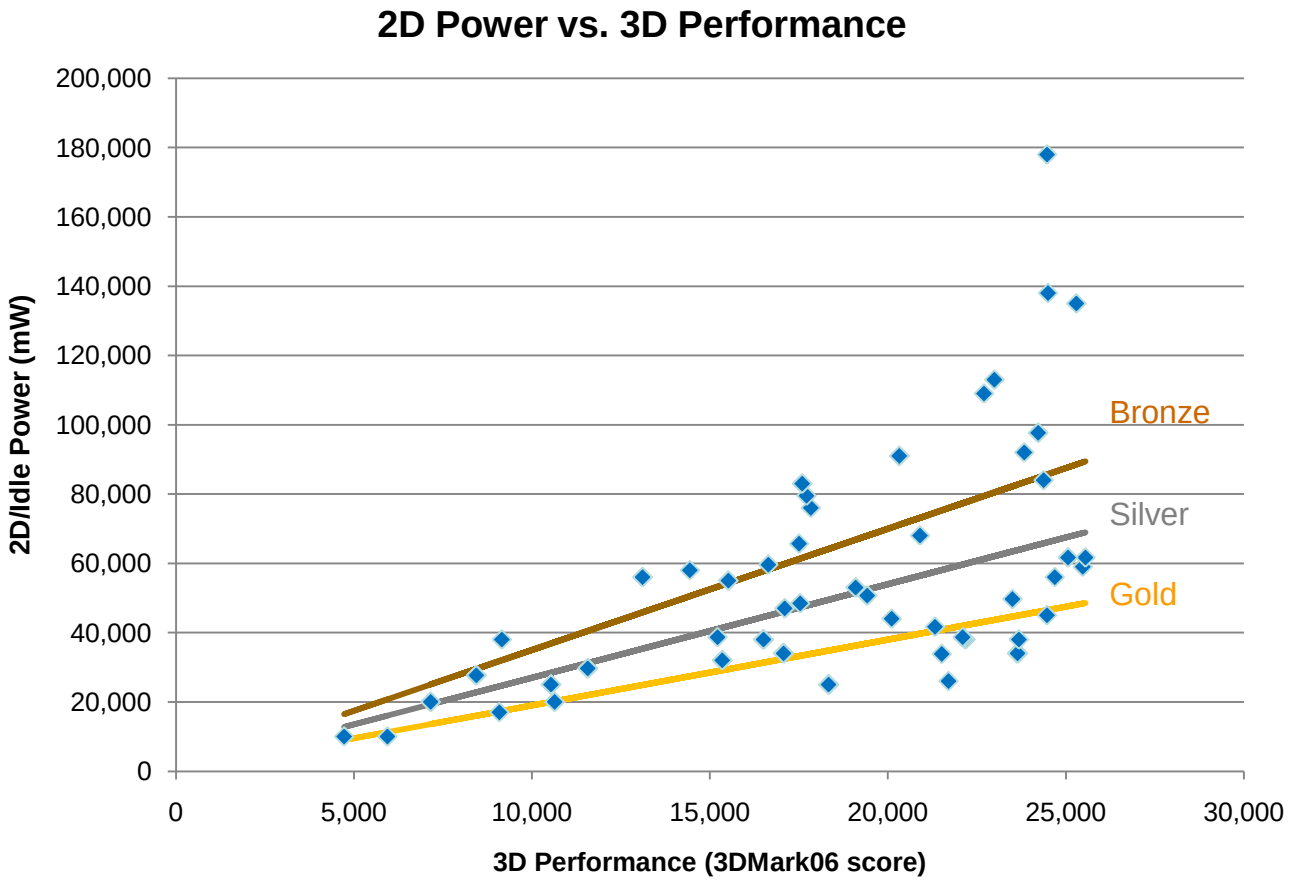
- Focusing on 2D will capture most of the savings opportunity
- Latency: which mode require immediate high Gfx performance?
- Test procedure: test for 2D Gfx energy use, not just strict idle

Two possible approaches:
1. Adders per ECMA 383 performance categories

	ECMA Categories						
	G1	G2	G3	G4a	G4b	G5a	G5b
Cat. A Discrete Graphics Adders							
Cat. B Discrete Graphics Adders							
Cat. C Discrete Graphics Adders							
Cat. D Discrete Graphics Adders							
Additional Graphics Adders (CAT A, B, C, D)							

- 7 ECMA graphics categories
- 4 Energy Star computer categories
- Additional graphics: for multi-card configurations (SLI/CrossFire)

Two possible approaches:
2. Performance-based standard



Performance standard (concept):

Bronze
Idle power ≤ 3.5 x 3DMark06 score
Silver
Idle power ≤ 2.7 x 3DMark06 score
Gold
Idle power ≤ 1.9 x 3DMark06 score

Similar approach to 80-Plus for PSUs: minimum efficiency level to qualify for Energy Star

Reducing graphics idle power from 32W to 5W would save 5 power plants in 2016

- Average DT dGfx idle power use on market in 2010: 32W
- Reducing discrete desktop graphics idle and low-graphics mode power from 32W to 5W, all else being equal, would save **5 TWh in 2010**, and **13 TWh in 2016** in the US.
- This is equivalent to **2 and 5 medium power plants** (500 MW) that can be avoided just by reducing idle, not touching active power use.

Source: NRDC estimates, based on Energy Star and other data on gaming device duty cycle

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