



EnergyStar V4 – draft 2
Consolidated Spec Feedback
9 May 2006

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Key Messages to EPA

- Draft2 spec of ES V4 included positive progress on several items
- However, several major directional changes were also included in draft2 which significantly limit the platform compliance opportunities for Desktop, Integrated Desktop, Workstation, and Desktop Derived Server (DDS)
- Intel recommends the following:
 - Lock in on the key positive spec items (detailed later)
 - Reconsider CPU cores as the Desktop system differentiator for Idle targets
 - Reconsider Intel proposal for Desktop Sleep power budgets
 - Reconsider efficiency spec proposal on 5VSB for internal PSU's
 - Consider power budget increases for Integrated Desktops
 - Workstation: Adopt 2 class system; Adopt % of PSU for Idle/Sleep targets; Remove Standby requirements
 - Defer Desktop Derived Servers compliance to Tier2

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Positive Draft2 Spec Items

- Compliance enforcement begins July 1'07
 - *Aligned to new platform introductions (good)*
- Tier I compliance duration (through Jan'09)
 - *January is still a 'tweener' market window, recommend Tier I thru Jun'09 (TierII begins Jul 1, 2009)*
- Network I/F = Ethernet (802.3)
- WOL required only for 'Enterprise' systems
 - *Consumer PC 'exemption' is appropriate and justified (good)*
- WOL in Standby now listed as 'not required'
 - *recommend more explicit verbiage "WOL shall not be enabled for any S5 configuration testing"*
- Adopted key attributes for Workstation definition
 - *Good start; additional feedback provided in this material*
- Aligned internal power supply requirements across all categories

Recommend:
Lock in these spec items as final

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Key Negative Draft2 Spec Items

- New definitions for Category A/B desktop platforms niches ES targets to only very high end and very low end desktop systems
 - *Holding same Idle power targets as in V4d1 is unreasonable given changes in definitions*
 - *Adding 'active' network connection to Idle test config w/o adjustment to Idle power not good*
 - *Unreasonable to hold Integrated Computers to DT class targets w/o adjustment to power levels*
- DT Sleep (no WOL) power budget reduction is not viable for compliance
 - *Contrary to data provided indicating power trending up due to memory technology transitions and non-deterministic nature of PSU 5VSB efficiency.*
- Movement to a line-item power budget for WOL & Memory in Sleep
 - *Selection of line items is arbitrary and adds unnecessary complexity to Tier I spec*
 - *Insufficient power budgets; puts S3 w/ WOL at lower level than draft1 spec (4.7W vs 5W)*
- Workstation def'n expanded to UP and DP w/o adjustments or exemptions for Sleep, Stby, or Idle
 - *Contrary to workstation use condition and needs to address persistent availability.*
- Inappropriate to combine DDS into DT spec compliance guidelines
 - *Biggest concerns re: Idle and standby due to persistent availability (uptime) requirement, monitoring, and variation in system memory loads.*

The likely result of these changes (primarily in definitions) is very little Desktop, Integrated Desktop, Workstation, or DDS compliance

Recommended Changes (Summary)

- Revert back to draft1 construct for DT system differentiator
 - Focus on CPU Cores for primary desktop delineator, remove Mhz
 - Hold 50W platform target for Single Core and 75W for Two-plus Core system Idle targets
 - Alternatively: Add 3rd tier for 4+ CPU Core Premium systems @ 90W Idle
- Base sleep target of 4W is insufficient for '07 DT; WOL adder of 0.7W is insufficient
 - Recommend:
 - Revert to ESv4d1 spec of 5W for S3, no WOL
 - Adopt 10W for S3, WOL
 - Adopt 5VSB efficiency recommendations
- Holding Integrated Desktop to Standard Desktop targets is insufficient
 - Propose 10% adder to Idle, 2W adder to Sleep & Standby for Integrated Desktop
- Update Workstation classification and limits to reflect use conditions and range of configurations accommodating increased system capabilities
 - Align to ITI proposal for 2 Workstation categories (Entry & High Performance)
 - Use % of PSU capacity as a scaling metric for Idle & Sleep targets
 - Remove standby specifications for workstations (inconsistent with use condition requirements)
- Push Desktop Derived Server targets to Tier2
 - Use condition will drive the need for persistent connection, availability and large local memories.
 - Alternatively account for increase, secured local storage, large memory, and comprehensive system management during both activity and inactivity.

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Data for Desktop S3 Budget Proposal

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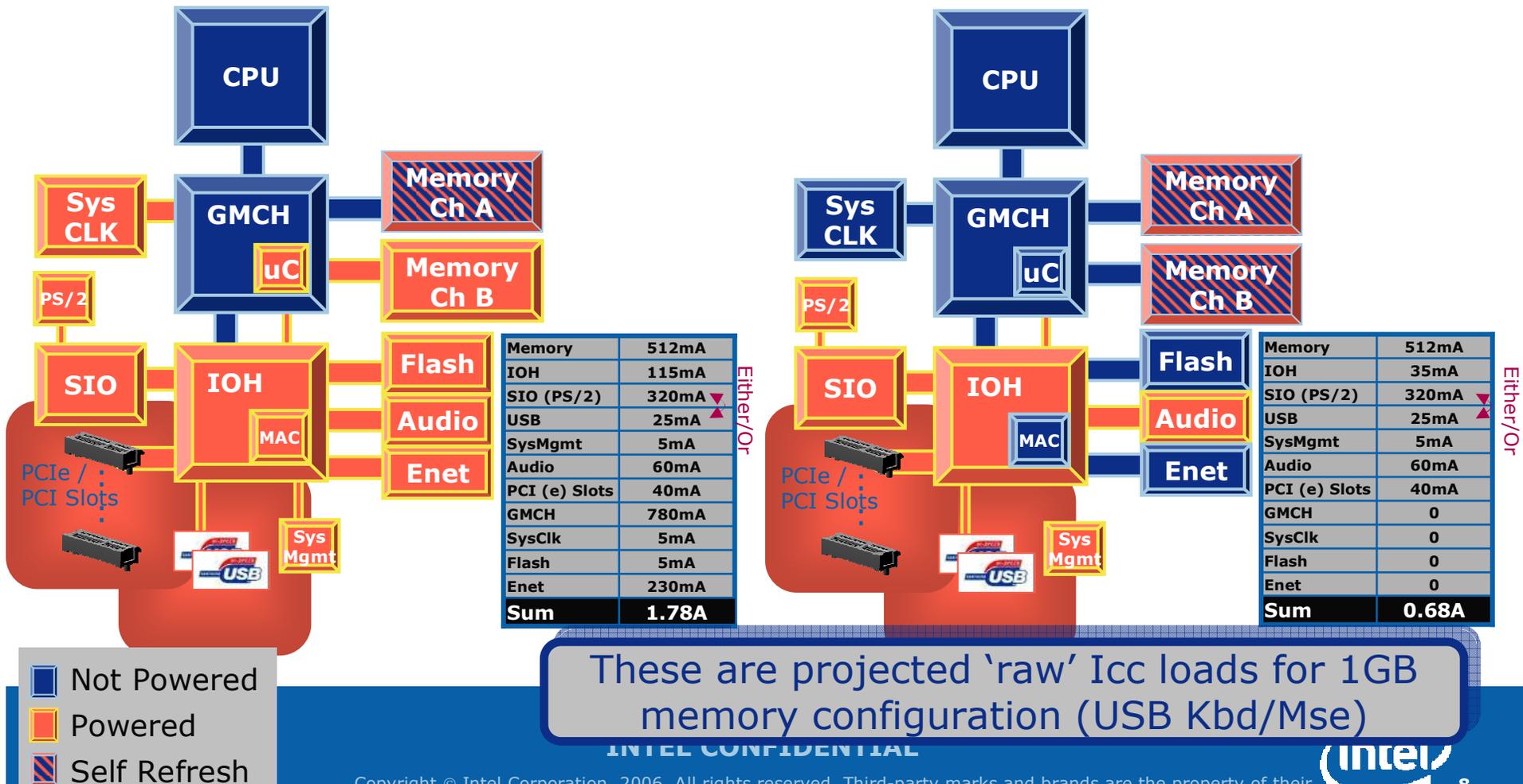


DT Sleep (S3) Budget Requirements

- Base DT S3 budget of 4W is insufficient for '07 platforms
- 0.7W adder for WOL is insufficient

S3/S4/S5 with AMT2 (WOL) Enabled

S3/S4/S5 with no WOL Enabled



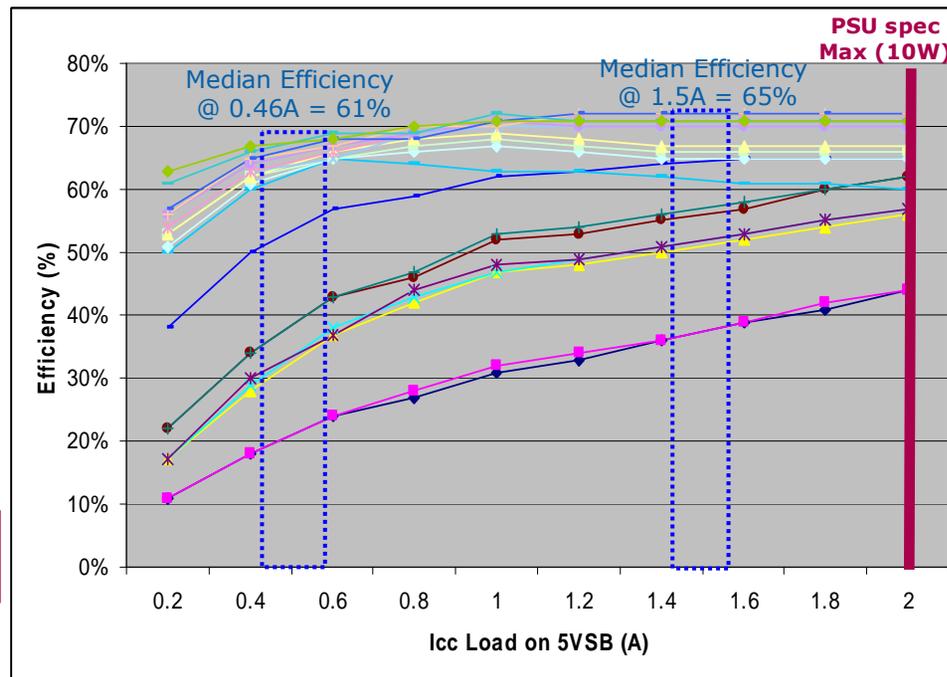
DT Sleep (S3) Budget Requirements – Con't

- From previous slide:
 - WOL Platform Icc \approx 1.78A
 - No WOL Platform Icc \approx 0.68A
- Random sampling of (19) off-the-shelf PSU's demonstrates broad range of 5VSB rail efficiency

Load Case	5VSB Icc Load	AC Watts @ Worst PSU Effic.	AC Watts @ Best PSU Effic.	AC Watts @ Median PSU Effic.
No WOL, 1GB Mem	0.68A	5.8W	4.3W	4.5W
WOL (AMT), 1GB Mem	1.78A	14.6W	11.4W	12W

4W for no WOL, 1GB* memory is insufficient in '07

0.7W adder for WOL is insufficient; exceeds 10W PSU max



Recommend: Set Tier1 spec @ 5W for S3, no WOL
Recommend: 10W for S3 w/ WOL (align to PSU max)
 Alternative: Adopt line-item power budget adder for 'service processor'; synergy with Workstation/DDS?
Recommend: Adopt 5VSB efficiency targets

*1GB system memory is minimum Vista reqm t

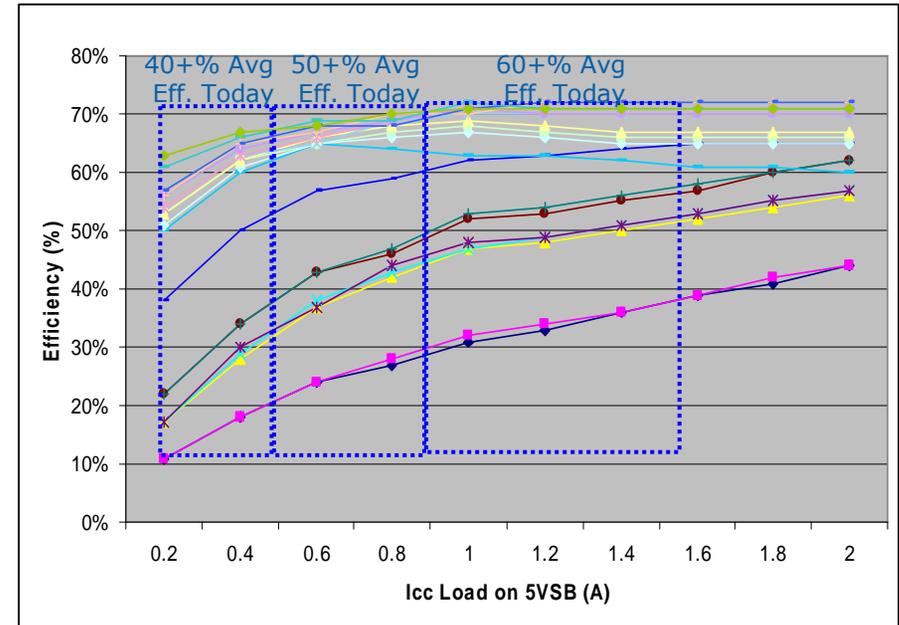
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5VSB PSU Efficiency Recommendation

- Random sampling of (19) off-the-shelf PSU's demonstrates broad range of 5VSB rail efficiency
 - ~60% PSU's follow Intel PSU design guide recommendation below right
 - Remaining 40% PSU's are all over the map
- PSU variability can cause up to **2X-5X** variation in AC Wall plug values for S3 and S5 measurements



Deterministic 5VSB efficiency is a prerequisite to achieving S3/S5 platform targets

Intel Recommendation

Pursue load based efficiency targets for 5VSB

5VSB Icc Load	Efficiency Target
0-250mA	50% efficient
250mA-1A	60% efficient
>1A	70% efficient

http://www.formfactors.org/developer/specs/PSU_DG_06.pdf

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Data for CPU Core based DT Segmentation

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Guiding Principles

1. Simplicity – Look for a defining attribute that is ubiquitous and intuitive to non-technical PC purchasers
2. Expedience – Focus on an attribute that enables Tier I spec closure vs opening up new debates
3. Relevance - Pick an attribute that represents the DT market reality for Tier I horizon (Jul'07-Jan'09)

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DT Idle Proposal

- Huge variability in type and amount of non-CPU system attributes (Gfx, storage, memory, etc..) permeates all PC system price points
 - Doesn't serve guiding principles 2 or 3
- ES v4, draft1 – delineator used CPU cores + CPU frequency
 - Meets guiding principle 1 but not 2 or 3
 - Frequency is becoming less relevant as an indicator of CPU performance
 - Cores are the new CPU differentiator
- Proposal: use CPU cores alone as Tier I DT Idle differentiator
 - Basic DT = single package, single core CPU
 - Performance DT = single package, 2+ core CPU
 - **Alternate option:** Add 3rd tier for 4+ Core Premium systems, 110W Idle target

System Class	Basic (1 Core)	Performance (2+ Cores)	Premium (4+ Cores)
Desktop	50W Idle	75W Idle	110W Idle

- Defer broader system definitions and Idle targets to Tier II timeframe

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Justification

- CPU cores as defining attribute for Tier I DT system differentiation meets all three guiding principles
- EPA stated goal for ES'07 – compliance limited to top 20% in 2007, 40% by 2010, $\geq 80\%$ by 2014
 - Dual Core CPU market penetration exiting 2007 could be up to 50%....BUT...
 - Not all Dual Core systems will meet Energy Star...
 - Only some Dual Core system price points will be viable for Gov't
 - Only some Dual Core platforms can meet 75W Idle target
 - Other HW config variables (Gfx, Storage, TVtuner, Drives, etc...) will restrict compliant configuration options
 - Many Single Core systems will not meet Energy Star...
 - Single core platforms will likely be most prevalent in consumer/retail markets
 - Energy Star is considered a modest PC purchase criteria in consumer DT
 - Some limited configuration Single Core platforms may be suitable for Gov't purchase

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Concerns with Active Network connection for Idle test mode

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Effects of the Ethernet PHY on WOL

- The Ethernet physical layer (PHY) power changes dramatically based on link state
 - ES v4d2 recommends switching to a lower link state when in sleep (good)
 - Example Ethernet PHY powers based on LINK state:
 - 1000BT (GbE) > 1W
 - 100BT ~ 500-800mW
 - 10BT ~ 300-400mW
- Test setup needs to allow the PHY to switch to lowest link state else power can be dramatically higher in any WOL state
 - Power will be multiplied from 2x to 4x
- GbE PHY power is over 1W when in 1000BT link state
 - EPA testing now requires UUT to be connected to active link
 - Yet idle power requirements have not been adjusted for Ethernet power
 - 80% efficient PSU adds over 1.25W to idle power if connected to a GbE switch!

*DC load values, does not
account for VR or PSU
efficiency*

Testing must require a Switch which allows entry into a 10BT mode, else Idle power targets must be increased

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Integrated Desktop

- Display technology trends increasing across the board
 - Fast migration from CRT → LCD (good for power)
 - Integrated desktops emerging especially in space-constrained environments
 - Trend to widescreen format displays (17"+), especially prevalent in Japan
- Typical external LCD display specs

Screen Size	Max Operating Power	Typical Operating Power	Standby Power
17"	35-45W	20-30W	<2W
19"	45-55W	25-30W	<2W
21"	55-65W	30-35W	<2W

- Typical Notebook LCD screen power is dominated by number of backlights utilized (typical Integrated DT likely to use 2-3 backlights)
 - Generates a power load of ~10W for 'in-use' conditions

Screen Size	Idle	Sleep	Standby
Std Desktop	50W / 75W	5W / 10W	<2W
Integrated DT	55W / 85W	7W / 12W	<4W

Proposed 

Recommend addition of ~10% budget to Idle and ~2W flat to Sleep & Standby budgets for Integrated Desktop

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