Information Technology Industry Council
Leading Policy for the Innovation Economy

ENERGY STAR® Computers (Ver. 6)
Display Adder Comments– Draft 2

ITI Presentation

June 22, 2012

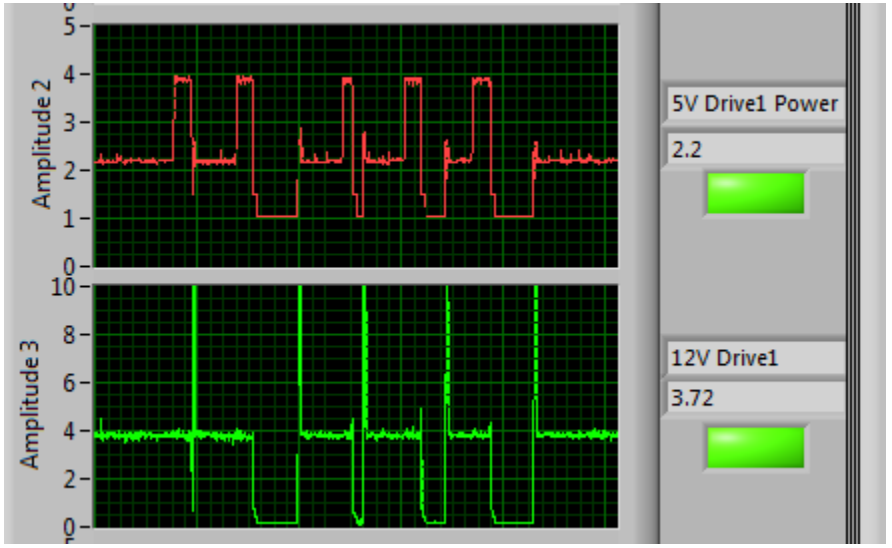
Agenda

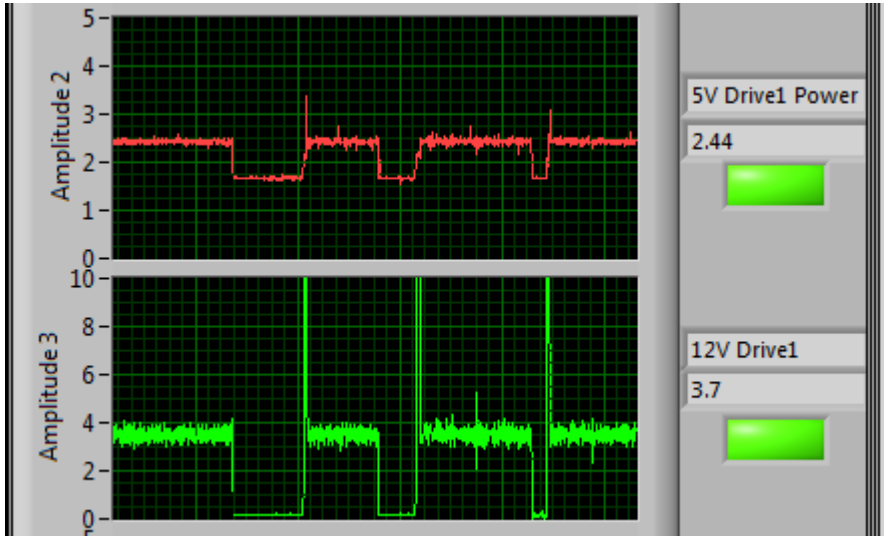
- Display adder considerations (Equations/V5.2 data)
  - HDD spin down considerations for display adder
  - Integrated DT (AIO) display adder/Equations
  - NB display adder discussion/Equations
- Enhanced performance display adders
- Thin Clients – S5/WOL limits
- Workstation- alternative benchmark (being finalized)
- Back-up ---HDD spin down profile

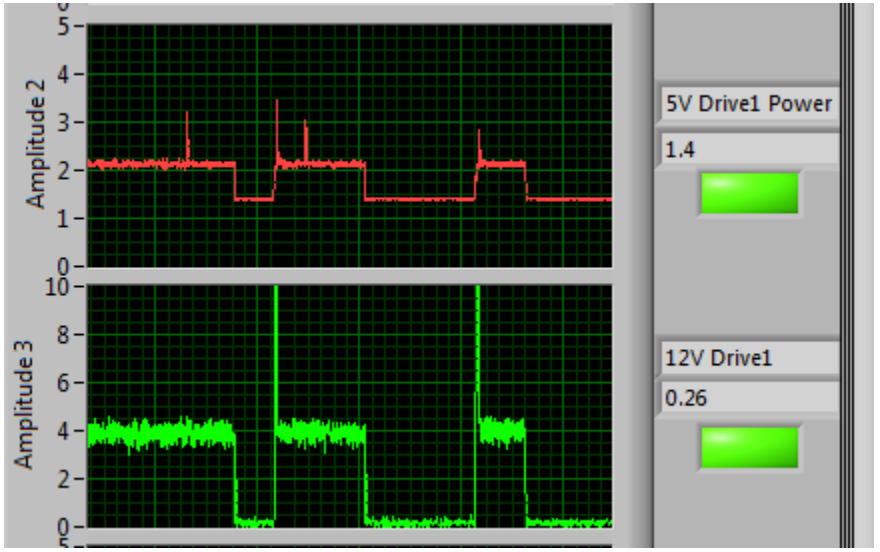
HDD Spin Down Considerations for Display Adder

- The graphs show HDD DC Power during Long Idle (Desktop – Standard Platter HDD)
- Even though HDD Spin Down can save up to 5 Watts,

Average over 5 minutes is ~2.3 Watts due to Duty Cycle of HDD

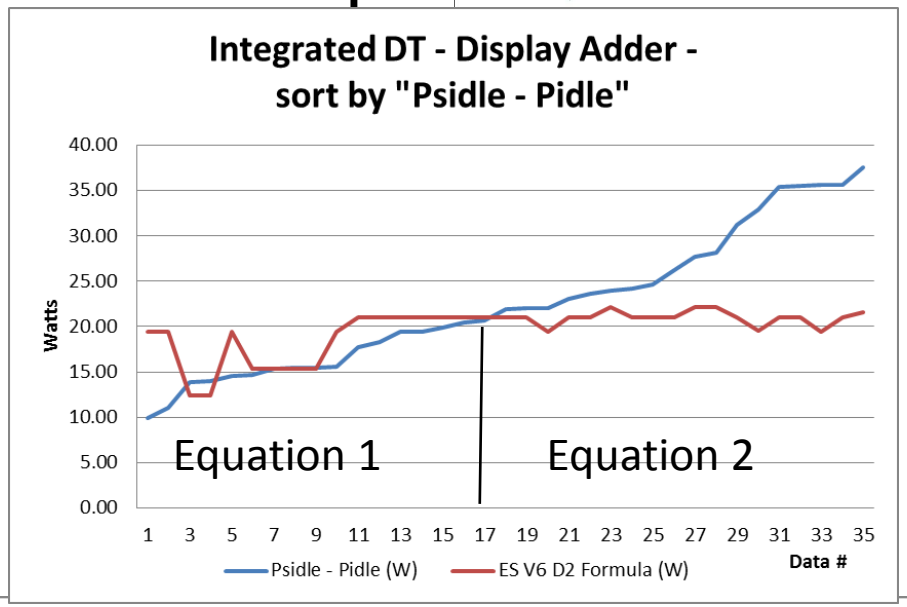






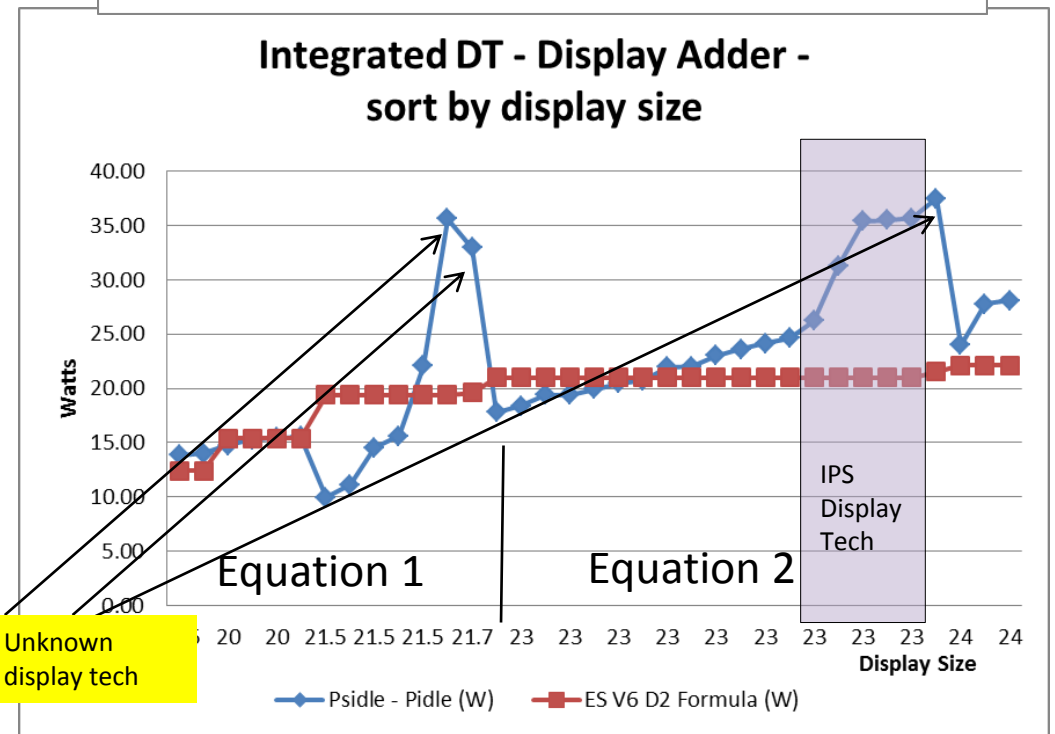
Display Adder – Integrated Desktops

- Average Data of V6 submitted data in EPA Dataset(new data)
  - Psidle – Pidle = 22.49 W (meas)
  - ES V6 draft 2 Formula = 19.65 W
  - Avg Ratio = 22.49/19.65 = 0.87
  - 35 Data Points
- Data to consider
  - Standard HDD Spin Down saving is ~2.3 Watts
  - Graphics output buffers ~0.5W



Recommendations:

- **V6 new data**: Two display adder equations may be better:
  - *One equation for display size under 22" and one above 22" (see chart)*
- **V5 Data**: To allow for better approximation of Display adder
  - *Use Psidle – [Pidle + 2.8 watts]*
    - **Issue:** Due to lack of display size, display adder data will still have more deficiencies
- **Enhanced Displays**:1.2 multiplier is not sufficient (>10W IPS/TN measured delta at higher screen sizes). **Industry will follow up with more data**



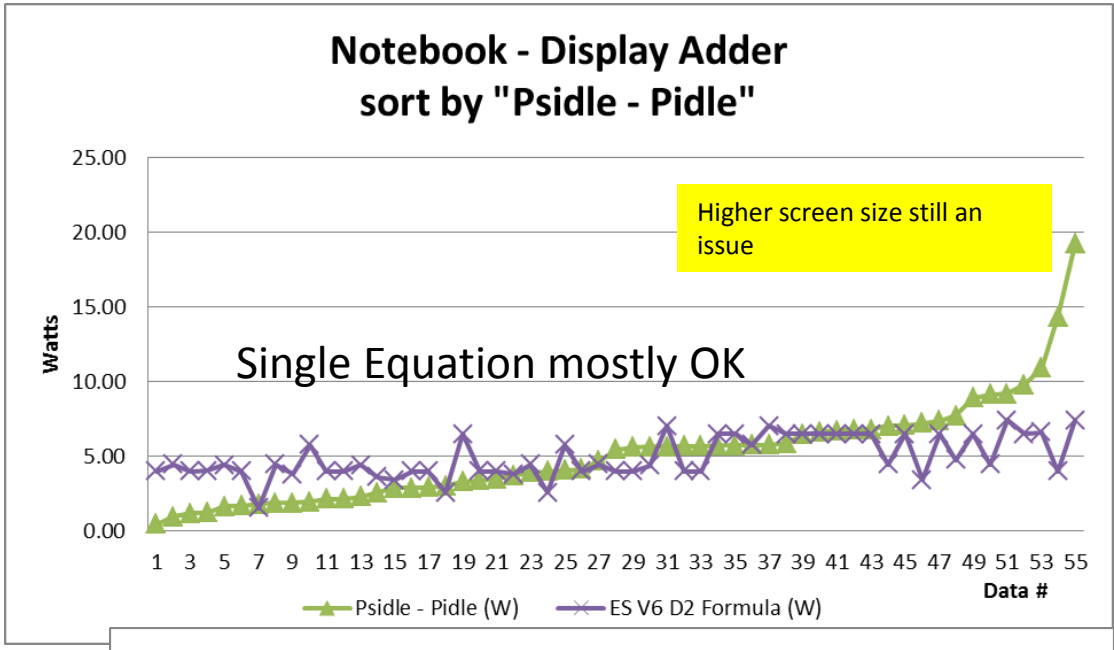
Display Adder - Notebook

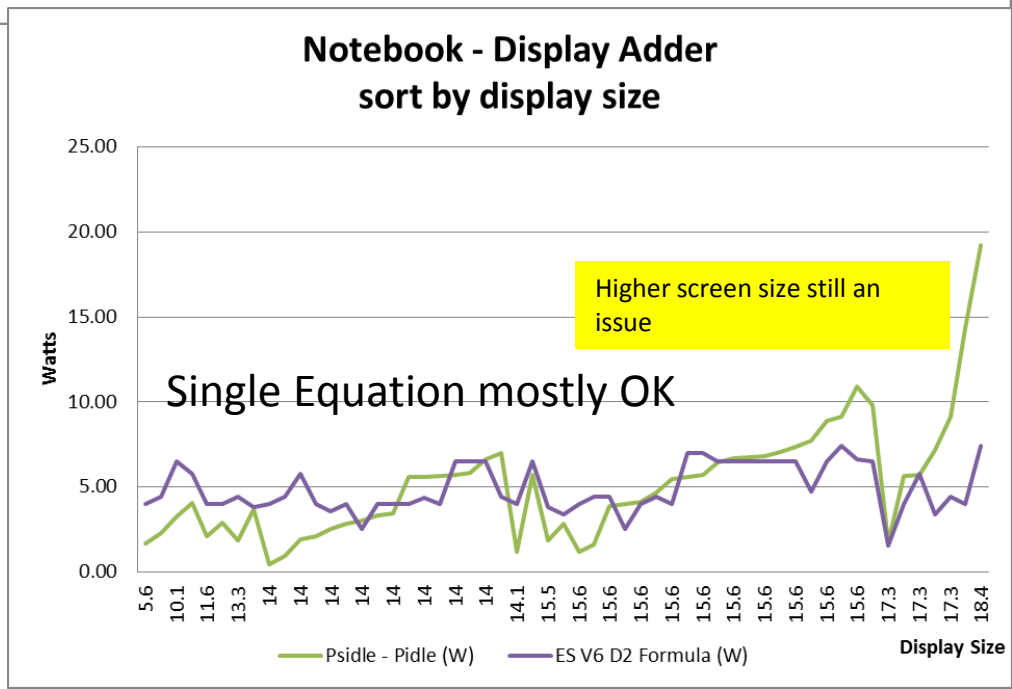
- Average Data of V6 submitted data in EPA Dataset (new data)
  - Psidle - Pidle = 5.14 W (Meas)
  - ES V6 draft 2 Formula = 4.91 W
  - Avg Ratio = 5.14 / 4.91 = 0.95
  - 55 Data Points
- HDD Spin down is less significant factor for mobile HDD
  - HDD Spin Down + Graphics Buffer ~ 0.5 Watts

Recommendations:

- **V6 new data**: Single display adder equations may be appropriate
  - *Tweak NB equation below for best fit*
- **V5 Data**: Use of Psidle-Pidle as proxy for display adder may be OK
- **Enhanced Displays**:1.2 multiplier is not sufficient (>10W IPS/TN measured delta at higher screen sizes). **Industry will follow up with more data**

Function	Desktop	Integrated Desktop	Notebook
Draft 2 $TEC_{INT\_DISPLAY}$ (kWh)[iv]	n/a	*(4.0 * r) + (0.05 * A)*	*(2.0 * r) + (0.02 * A)*





Enhanced Performance display allowance - I

- Analysis Methodology & assumptions:
  - Compare like systems (TN vs. IPS) using same product categories, graphics classes, and other common attributes to the extent possible
  - Step 1: Use measured TEC data and adders to get to adjusted TEC, by subtracting out all adders and normalizing all data to TN panel (No IPS multiplier).
  - Step 2: Find the right multiplier for enhanced performance displays that generates IPS TEC allowance, which when subtracted out from measured TEC, allows adjusted TEC for IPS and TN systems to be roughly equal (given everything else the same). The right multiplier allows the difference between adjusted TEC of TN and IPS system to approach zero.
    - AIO: Refer to columns BJ, BK, BL, and CN, CO, CP (Light Green columns – in Excel)
    - NB: Refer to columns BF, BG, BH, and CI, CJ, CK (Light Green columns – in Excel)
- Closest possible system was used when the exact configuration was not available
  - All TN data used was from Energy Star V6 submitted dataset

Enhanced Performance display allowance - II

- Findings:
  - **AIO IPS Multiplier**: Range 1.35-1.58 (based on 27" IPS based systems compared with 27" TN based systems). This is roughly in alignment IPS external displays data showing that on average, a 67% adder is needed (using Energy Star 5.1 on-mode limits for Displays as a baseline)
  - **Notebooks IPS Multiplier**: Range 3.7-4.0 (based on IPS NB3 G1 based systems compared with similar TN NB3 based systems). One IPS system fell in both NB3 or NB4 category. For this we could not find a good TN matching pair to compare this system
- Explanation for a different IPS display multipliers (AIO vs. NB)
  - The absolute delta between IPS and TN display TEC allowance is roughly the same for NB and AIO (53-62 kWh) – See Excel
  - The IPS multiplier is much higher for NB, since the NB IPS panel power contribution to measured NB system TEC is much higher (Note: NB TEC values are low)
  - AIO IPS multiplier is proportionately lower since AIO IPS panel contribution to measured AIO system TEC is lower than the NB above.
  - This allows a smaller multiplier for AIO IPS displays to equalize adjusted TEC of TN and IPS systems, while in the case of NB a higher multiplier is needed to offset the higher panel power contribution.

Enhanced Performance display allowance - III

- Challenges:
  - Finding IPS and TN system pairing for proper comparison
  - Smaller sample size
- Conclusions/Next Steps:
  - It will not be one-size-fits-all. NB and AIO will need to get separate enhanced display multiplier – similar to getting separate base display panel equations
  - The display equations are not perfect and ITI has already proposed EPA to consider HDD spin down power contribution, and consider two separate display adder equations for AIO systems. After the base display adder equations are refined the enhanced performance display multiplier will likely change.
  - Industry is planning to run controlled paired experiments for NB and AIO (standard vs. enhanced performance displays), where the only variable is the panel type (using the same system).
  - Industry recommends EPA to adopt Industry's current findings for draft 3. Final multiplier can be set after tuning the base display adder equations and any new data coming from controlled experiments

Thin Clients

Key Issues/Recommendations:

- **Off limit**: Should EPA plan to use the Lot 6 Tier II 0.5 watt Off limit as the base S5 limit for Thin Clients, the Industry needs ≥ 0.7W WOL adder to meet ≥ 1.2W budget. Attached 32 system WOL power data (Excel) shows that there is enough system to system variability to warrant higher than 0.6 WOL adder.

Mean	STDEV	Mean + 1STDEV
0.60	0.25	0.85

- **Idle limit**: The Thin Client market is rapidly transitioning to the use of power managed operating systems. However there is a sizeable customer base that demands operating systems that are not power managed. A 12 watt idle is inadequate.
  - **Recommendation**: To simplify the Thin Client energy regulation paradigm, Industry suggests using a 15 watt idle limit for all Thin Clients that employ internal graphics.
- **Discrete Graphics Solution**: Some customers are demanding a richer graphics experience from Thin Clients. For these users, higher powered discrete graphics solutions are utilized.
  - **Recommendation:** Separate category or adders for Thin Clients with discrete graphics.
- **TEC idea:** Would EPA be interested to discuss the option of TEC approach for Thin Clients?

Workstations

- **Industry is working on alternative to SPECWorkstation benchmark for Energy Star V6 workstation data collection exercise. The proposal is being finalized and will be available on Monday**

Will be available by COB Monday 6/25

Next Steps

- Industry proposal on Workstations data collection
- EPA report-out on alternative categories data analysis. Plan EPA/ITI meeting to discuss

Back-up

V6 Long Idle – HDD Spin Down overnight – 15 hours

- HDD never stays spun down for long