ENERGY STAR Computer Industry Stakeholder Meeting
Washington, DC
March 15, 2005

Meeting Notes

More than 50 people representing computer manufacturing companies, component OEMs, trade organizations, international entities, and other industry stakeholders attended the ENERGY STAR Computer Industry Stakeholder Meeting in Washington, DC. Please refer to the Final Attendee List for the names of those who participated in the meeting. The attendee list and meeting presentations can be downloaded from the ENERGY STAR computer specification revision Web page at: www.energystar.gov/productdevelopment. Click on "Revisions to Existing Specifications" on the right navigation bar.

Provided below is a summary of the slides that were presented and the discussions that took place during the meeting. For ease in reviewing these notes, EPA has divided and grouped discussions according to topic. Where EPA was able to address stakeholder comments and/or questions during the meeting, these responses are provided within the notes below. EPA is continuing to research all comments and concerns that were raised during the meeting.

If you have any questions or comments on these notes please send them to Craig Hershberg, EPA, at hershberg.craig@epa.gov or Rebecca Duff, ICF Consulting, at rduff@icfconsulting.com.

At the beginning of the meeting EPA presented Advanced Micro Devices (AMD) with a special recognition for the "Advancement of PC Energy Efficiency". AMD was specifically recognized for efficient design innovations such as their Athlon™ 64 microprocessors with Cool'n'Quiet™ technology and significantly advancing the area of computer energy efficiency, as well as heightened awareness of both reducing active power and of ENERGY STAR.

Overview of EPA's Intentions – Craig Hershberg, EPA

Mr. Hershberg began the specification discussion by reviewing the history and evolution of the ENERGY STAR computer requirements and presenting the reasons why EPA is revisiting the computer specification, which primarily are: (1) high market penetration of ENERGY STAR qualified computers (98%); (2) address active power and peak operating load; and (3) low enabling rates.

According to data collected by Lawrence Berkeley National Laboratory (LBNL) at various commercial buildings – within metropolitan areas – actual sleep enabling rates are lower than expected (approximately 5%). Paolo Bertoldi, European Commission, shared with the group that their preliminary studies on enabling rates found them to be even lower than U.S. estimates.

Jeff Harris from the Northwest Energy Efficiency Alliance (NEEA) spoke to the group about plans to provide incentives toward purchases of energy-efficient electronics products. NEEA has put $900,000 on the table this year geared toward addressing the first cost of using more efficient power supplies (80% +). NEEA is talking to other regions and states, including the Northeast and California (SDG&E, PG&E, SCE); currently a total of $2 million has been committed from utilities in the west and the northeast for manufacturers that ship computers within a particular zip code(s) to receive a $5.00 rebate for each unit shipped. This initiative will

be supported by marketing and outreach efforts to institutional purchasers. If EPA decides to require 80% efficiency at 25%, 50%, and 100% of load for computer power supplies in the specification, this utility initiative will help increase awareness and provide additional incentives.

Provided below are stakeholder comments and questions regarding EPA's reasons for revisiting the computer specification, below:

(1) Enabling Rates

General Comments
- Enabling rate is still a major issue and tackling it would involve more than just ensuring power saving features are enabled when shipped (educating end users, etc.).
- Working toward a solution to the enabling problem should be the alternative to specifying on-mode levels. If the amount of "on" time can be reduced then trying to determine the appropriate "on" mode criteria becomes less important.
- A number of attendees suggested that EPA bring together various stakeholders to address the power management enabling issue, including hardware and software contacts, with a key focus on the network problem. Intel and Apple offered to host these discussions in the near future. Representatives from the Information Technology Industry Council (ITI) and the European Experts Working Group offered their support of this type of meeting.

Stakeholder Question: Regarding the slide titled "Good work already underway: sleep and standby modes", are the tested models ENERGY STAR qualified and is this graph representative of what is really going on in the U.S.?

EPA Response: Due to the large market penetration (98%), we can assume that the majority of PCs sold today are ENERGY STAR qualified and therefore, most of these models presented in the chart shown on this slide are qualified. Data used to create this chart was found in a report by LBNL," After-hours Power Status of Office Equipment and Inventory of Miscellaneous Plug-Load Equipment", January 2004[1]. To download this paper and related data go to:http://enduse.lbl.gov/Projects/OffEqpt.html. Similar surveys performed at other facilities indicate that most computers are not enabled for sleep.

Stakeholder Question: Is EPA going to be testing computers moving forward to determine whether or not models are utilizing power management capabilities?

EPA Response: Yes, EPA will continue to test and monitor usage of power management functions.

(2) Energy Savings Estimates and Assumptions

General Comments
- EPA should consider enabling and enabling rates when determining the potential savings of the proposed specification. If the industry addresses enabling then the total savings from the proposed Tier I levels will be affected.
- EPA should include numbers from the EU and other countries to determine total savings especially if harmonization of the specification occurs.

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[1] Authors: Judy A. Roberson, Carrie A. Webber, Marla C. McWhinney, Richard E. Brown, Margaret J. Pinckard, and John F. Busch, Energy Analysis Department Environmental Energy Technologies Division Ernest Orlando Lawrence Berkeley National Laboratory, University of California, Berkeley CA

- EPA should allow stakeholders to review and comment on all of the assumptions made in calculating the potential energy savings.

EPA Response: EPA will make all assumptions that were made in determining the potential savings from the proposed new specification available following the meeting. Stakeholders are encouraged to comment on these assumptions. EPA will also re-evaluate these savings based on different enabling rates and worldwide use of these products.

(3) Market Penetration Targets

General Comments
- EPA should have engaged industry members in preliminary discussions prior to releasing the Preliminary Draft document to determine whether or not the program should be inclusive (100% models qualifying) or exclusive (some % of the market qualifying). Even though the document is "preliminary", manufacturers now have to deal with the levels possibly being adopted by other governments and agencies with large procurement.
- The percentage of qualified units shouldn't matter as long as the ENERGY STAR specification provides incentives to the manufacturers to develop products that meet the specification.
- There is some concern that state regulators will adopt ENERGY STAR standards in the future.
- EPA needs to be careful because the top 25% may not be the most efficient and functional. By being too stringent, EPA may be excluding higher end products that are using new technologies, requiring more power.

EPA Response: One of EPA's guiding principles in developing and revising product specifications is to set performance levels such that approximately the top 25% of performers in the marketplace can earn the ENERGY STAR.

Stakeholder Response: In Europe it is important to keep the market penetration no greater than 25% of units sold. If ENERGY STAR ends up increasing this market penetration target, there is a greater chance EUP (European Union Directive, Energy Using Products) would adopt a more stringent requirement.

Tier I Preliminary Draft Specification Discussion – Craig Hershberg, EPA

Mr. Hershberg led the group through each proposed specification requirement of the Preliminary Draft computer specification. The Preliminary Draft specification can be downloaded from the ENERGY STAR Web site at www.energystar.gov/productdevelopment. Where available, performance data was shared with the group supporting the proposed levels. Where there was less data available, manufacturers were encouraged to test their own models and/or components to assist EPA in determining the most appropriate performance levels. Specific stakeholder comments for each section of the Preliminary Draft are provided below:

(1) Definitions

General Comments
- EPA may want to consider the server definition already developed by RoHS (European Union Directive on Restrictions on Hazardous Substance). However, the group was unsure

whether or not this particular definition would apply to desktop derived models. This resource takes into consideration the critical nature of the server when defining the product.
- The server definition as written in the Preliminary Draft looks more like a workstation definition.
- EPA should use "off" instead of "standby" throughout the specification.

Stakeholder Comment: Industry members may be able to define idle based on the amount of time elapsed after initial start up – one suggestion, based on preliminary testing, is 10 minutes.

Stakeholder Response: A problem with testing idle power at the 10 minute mark is that accurate testing would be difficult when EPA is requiring those same machines to go into sleep at 15 minutes.

General Comments
- Based on the low enabling rates discussed early in the meeting, idle power would address power usage if the computer never goes to sleep.
- EPA should concentrate on power supply efficiency to address idle power.
- Idle state is hardly ever talked about in the industry because it rarely actually happens. As defined in the Preliminary Draft, the only time there is "no activity taking place" is when the computer is turned off.
- Entertainment (Media) PCs are an important segment of the marketplace but very hard to define. One suggestion is for EPA to take these product types out of the specification until they are better defined within the marketplace.
- Regarding the inclusion of thin clients, EPA should follow up with those manufacturers who sell them to discuss any potential definitions and requirements.

Stakeholder Question: Should the specification include a definition for "family" of products? For example, there may be one base model and then minor variations to that basic design depending on the need of the purchaser/user.

Stakeholder Response: There are families of products now that are qualified as ENERGY STAR; however, it was less of a concern given that sleep mode was the only requirement. One question that needs to be addressed regarding families of models is how many variations can be made to the base model before it is no longer considered ENERGY STAR?

(2) Standby Power Levels

Stakeholder Question: Why doesn't EPA just defer to the ENERGY STAR external power supply specification as opposed to including an actual number for notebook standby levels?

Stakeholder Response: EPA should include a performance level rather than just referencing the ENERGY STAR external power supply specification in case there is a delay in implementation or a change to the currently proposed no load levels under Tier II.

(3) Sleep Mode Levels

General Comments
- One challenge for EPA is that a manufacturer could market a desktop as a server, which would then allow for a higher energy consumption threshold (the levels are more stringent for desktops). The difference between a desktop and a server is largely dependent on the marketing of the product.

- The existing method for determining maximum sleep level allowances (e.g. % of power supply) is much more appropriate while considering functionality – one size does not fit all. EPA should consider different levels for larger workstations.
- The machines that use higher capacity (watts) power supplies are responding to a need in the marketplace. It costs more money to include a larger power supply; manufacturers are not oversizing power supplies on purpose.
- The reason that manufacturers oversize power supplies is because they need a common system platform that is robust enough to handle increased functionality across the board. For example, a 64-bit architecture and additional memory to support it will require more energy in sleep.
- Customers demand upgrades to their systems down the road, which requires more power.
- Functionality is separable within the power supply chip: "standby" and main power are separate functions and should not be linked together.
- EPA needs to have additional discussions with manufacturers before determining whether or not to remove the sliding scale for larger computers, which is allowed under the existing sleep requirement.

EPA Comment: As a group we need to further define a workstation, and review additional test data, prior to determining whether or not the proposed 5 W requirement is appropriate.

Stakeholder Response: Industry members will work to get EPA a definition for workstation.

Stakeholder Question: Did EPA take into account high end computers when developing these initial levels? EPA needs to consider technologies on the horizon – the proposed 5 W level is very difficult for higher end products to meet.

EPA Response: The analysis presented is based on test data and information made available to date. Manufacturers are encouraged to provide additional data to help develop a more complete dataset. EPA will meet individually with manufacturers to discuss these issues further as well as plans for new technologies.

EPA is willing to consider different performance levels for larger workstations but unless we can determine the difference between a workstation and desktops, larger workstations will not be separated out and will be required to meet the same sleep mode levels as desktops.

General Comments
- Regarding the proposed requirement of all computers transitioning from the sleep mode to full active state in no less than a specified amount of time (seconds): many stakeholders agreed that this is already being done in the marketplace today (e.g., 5 seconds or less) and is not needed in this specification.
- The proposed new requirement for computers to go to sleep is 15 minutes, as opposed to the existing 30 minutes, is possible but could be risky because people may disable the enabling feature due to frustrations with the machine always powering down. What actual savings could be achieved through such a small change? Is there any usage pattern data that supports the need to shorten the response time?

EPA Response: EPA will take a look at the incremental savings that could result from computers going to sleep in 15 minutes as compared to the existing 30-minute requirement.

(4) Active Mode: Power Supply and Idle Power Levels

Stakeholder Comment: Newly developed computer power supplies from manufacturers such as Seasonic and On-Semi are already meeting or exceeding the Preliminary Draft proposed internal power supply levels. These power supply designs will limit the use of fans, further decreasing energy consumption.

EPA Comment: Computer and power supply manufacturers are encouraged to work with EPRI Solutions test laboratory, developer of the internal power supply test procedure, to test their products.

Stakeholder Comment: EPA and industry should try to solve the enabling rate issue first under Tier I and then tackle idle power under Tier II. Why add a third "fix" toward the enabling issue? EPA should not take three different approaches toward addressing the one problem that seems to be looming: power management enabling.

EPA Response: After a certain point further reduction in sleep and standby power results in diminishing returns so in order for the ENERGY STAR to continue to make an impact in the marketplace, active mode must be addressed. Addressing energy use while the computer is in active mode ensures savings even in cases when power management is disabled.

General Comments
- EPA should include the monitor active power level in the number for integrated computers, not sleep as it currently is written in the Preliminary Draft specification.
- Assuming that monitor power management is enabled, there won't be that much idle time when the monitor is on in the course of the year. You only get significant idle time if the PC power management is disabled. The monitor should be off for the measurement and testing of idle.
- While pursuing idle power is good in theory, the industry is just not ready to address it yet.
- Even the 15-W notebook idle rate would be difficult to meet due to a number of variations that exist in this product type.
- Idle rate may be constraining to product design; manufacturers are beginning to feel that EPA is trying to dictate how to design the product, which is a problem.
- Idle is not easily defined and even harder to pinpoint. EPA is asking manufacturers to shut down functionality of the machine and use different software.
- EPA's next step should be to continue collecting data based on preliminary efforts to test and measure idle before determining levels.
- Idle mode is a workaround for the disabling problem and could present a problem for the manufacturers.
- EPA suggests a 50 – 60W range for desktops in idle mode, however, data available from testing idle rates within the UK shows desktops performing within an 80 – 130 W range.
- One of our models uses around 100 W in idle but it is a more powerful machine and is regarded as energy-efficient. What might happen as a result of this specification is that the lower end models will easily meet idle but the higher end will not because more power is needed to support additional functionality in idle.
- The problem probably lies in the graphics/video card, even in the case when the processor throttles back. How will EPA address energy use by so many accessories (i.e., wireless tech, video cards, etc.) when they are not being used?
- When defining idle EPA should determine what can be "on" during the testing.

- Everyone in the industry is testing idle mode differently. Many of the manufacturers can provide EPA with data but we need to know what test procedure is acceptable. Right now, preliminary data show numbers that are higher than EPA's proposal.

(5) Tier I Effective Date

Stakeholder Comment: Manufacturers need at least 18 months from the final release date to redesign products to meet the new specification. The 12-month transition time proposed in the Preliminary Draft specification is not sufficient.

EPA Response: EPA will work with manufacturers to determine an appropriate effective date given manufacturing cycles and other considerations.

Views from the European Experts Working Group on the Computer Specification Revisions – Paolo Bertoldi, European Commission

Mr. Bertoldi presented the European Experts Working Group's views on EPA's proposed new ENERGY STAR computer specification. The European Experts Working Group is very interested in the computer specification revision and the future of ENERGY STAR in Europe is closely linked to more demanding specifications. The following are some key points of this presentation:

- The definition used for notebook versus desktop is very simple and uses battery capability as the main differentiator.
- Since integrated computers only use one power supply the European Experts Working Group feels that the additional monitor requirement is not necessary in the total energy consumption value; therefore, the minimum requirement should stay at 5 W.
- The sleep definition should follow Advanced Configuration and Power Interface (ACPI) Level S3 power state.
- The European Experts Working Group would like to address idle power under Tier I but realizes that a test method needs to be developed and levels determined through additional manufacturer testing using this method. Denmark has an idle definition and requirements that EPA should review.
- The European Experts Working Group agrees with the external power supply requirements set forth on the proposal.
- The European Experts Working Group recommends benchmarking under Tier II.

Stakeholder Question: Where did the European numbers come from and are they available to industry for review? How important is idle power to the EU – will the lack of a consensus keep you from moving forward with a program?

Bertoldi Response: Data came from testing conducted by national laboratories, energy agencies, consumer reports, and computer magazines. We believe that idle power is worth the effort but are unsure at this time what will happen to the program requirements if levels are not pursued.

Tier II Discussion
Note: The primary goal of this portion of the meeting was to provide to attendees preliminary thoughts on how to address the network problem and total energy consumption under Tier II. Limited comments were received during the meeting regarding these presentations.

Fixing the Network Problem – Bruce Nordman, LBNL

Today's PCs lose general network connectivity while in sleep mode[2], and this is increasingly unacceptable for many home and office uses of PCs as more applications are inherently network-centric. This is likely the dominant reason for the high rates of power management disabling observed (94%), in contrast to LCD displays (25%) and printers (10%). The potential savings from increased PC power management alone are large—twice that of the currently proposed Tier I—and could be easily extended to non-ENERGY STAR PCs and in the future to many consumer electronics devices, multiplying savings further. Fixing the problem will also increase user amenity. The most likely technical solution is an industry standard definition of a "Smart NIC (Network Interface Controller)". With the network problem fixed, other disabling issues can be addressed much more easily. A second opportunity is "Dynamic Link Rate Reduction" of network links which offers lower savings potential but should be easy for industry to implement.

General Comments
- The potential savings from greater enabling are clearly substantial, and the network issue is a key part of that.
- The rampant disabling does not reflect well on industry or EPA.
- ITI and Intel offered to coordinate a kick-off meeting to bring industry together to discuss next steps toward addressing power management disabling, with a focus on the network problem.

Prescriptive Approach – Chris Calwell, Ecos Consulting

Mr. Calwell provided an overview of individual component energy consumption and preliminary ideas about areas where EPA could focus its research if it chooses to pursue total system energy consumption through a prescriptive approach. The following are some key points of this presentation:

- The power supply is important in considering energy consumption of computers but it is not sufficient; other components need to be considered when looking at potential component-based levels.
- Video cards in the marketplace today can use as much as 250 W and include separate connections to the power supply. In addition, many of these cards require their own cooling fan that uses energy as well.
- Processor throttling is commonly available today and can result in 20% or more in energy savings.
- Dual core processors are gaining market share and provide more functionality with less energy.

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[2] Existing Wake-On-LAN features usually do what they claim to and are satisfactory for some (mostly commercial) usage environments. These should continue to be promoted for use when appropriate as we move to a more general and widely applicable solution.

- According to measurements taken by Ecos Consulting, high performance video cards can increase ac consumption of a computer by as much as 40 W.
- Holistic system design and a cleaner, simpler installation of components create minimal need for long runs of loose cabling, offering better control of thermal performance in individual zones, thereby allowing more optimal sizing of the power supply.
- DDR2 is in the process of supplanting DDR memory – savings of about 20 to 25% by moving to a faster, lower voltage technology.
- There can be a 5 – 6 W difference between single-fan and multi- fan configurations. Some of these fans can be designed to come on only when needed. For example, Apple's iMac includes four fans that only come on when needed.
- Components can be designed in a linear fashion such that only one fan is need to cool multiple components at one time.
- User intuitive software that enables hardware solutions is important to ensure energy savings.
- Power management software could be better designed to encourage enabling.

System Efficiency/Performance Approach – Suzanne Foster, Ecos Consulting

Ms. Foster then provided an overview of benchmarking software available in the marketplace today and preliminary ideas regarding how EPA might use a similar system to measure total system energy consumption. The following are some key points of this presentation:

- No benchmarking software available in the marketplace today that addresses cost effectiveness and other needs for the ENERGY STAR specification. One could be developed for ENERGY STAR that includes all components.
- Treat computer system as a black box and measure the system efficiency.
- Use a software benchmark to simultaneously measure the energy use of the computer and the performance over a set of established tasks.
- Tasks performed by the computer over the course of the benchmark should be based on the way a computer is actually used in home and office environments.
- One metric created for the efficiency of the computer. Options include: performance score per annual kWh and performance score per watt-hour (Wh).
- Measure the efficiency of the interaction of all the components inside the housing of the computer and leave the power engineering to the OEMs and component manufacturers.
- Benchmarking already routinely used in computer industry marketing campaigns and buyers' guides.
- Ideal software benchmark for a system efficiency approach would:
  – Characterize the typical duty cycle of computer in home/office/data center.
  – Be developed independent of one specific hardware technology or software platform (enable fair comparison of Apple/SUN/Linux/Unix/Windows machines and Apple/AMD/SUN/Intel/Transmeta based machines).
  – Be relatively easy to use for quick turn-around measurement in laboratory.
- Benchmarks commonly characterized by normal versus maximum performance. There are generally two ways that a computer might do well when using an efficiency metric that considers a performance to energy consumption ratio: high performance or low energy (performance per watt-hour or watt).

<u>Stakeholder Comment</u>: EPA may want to consider normalizing the benchmark by taking watt-hours or watts and dividing by performance, which would result in a lower number for higher performance.

Meeting Wrap-Up and Next Steps

Mr. Hershberg provided a list of topics and areas that require additional research, based on meeting discussions:

- Low enabling rates are an important issue worth pursuing. A number of industry members offered to lead additional and focused discussions on the enabling issue following this meeting.
- Idle power needs to be defined and a test procedure determined before deciding whether or not to include it in the specification.
- Workstation needs to be defined and proposed sleep levels for larger models revisited.
- EPA has limited data on idle power. Stakeholders who wish to provide additional information or data for consideration while developing the Draft 1 specification can contact Craig Hershberg, EPA, at hersberg.craig@epa.gov or (202) 343-9120.

Specific next steps include the following:

- EPA will post meeting notes, presentations, and assumptions to the ENERGY STAR Web site at www.energystar.gov/productdevelopment. Stakeholders will be given additional time to review the Preliminary Draft specification in light of these discussions.
- In the short term, EPA will provide the assumptions used in determining the potential energy savings due to the proposed Tier I performance requirements to stakeholders for review and comment along with the meeting notes. Longer term, EPA will revisit these assumptions and present to stakeholders the following:
  – Comparison of savings in various enabling and non-enabling scenarios and determine the savings that can be attributed to the proposed Tier I performance levels.
  – Incremental savings of going from a 30-minute sleep default time to a 15-minute default.
  – Potential global savings of proposed Tier I levels – work with Europe, Australia, China, and others.
- EPA will work with industry on definitions for desktop derived server, workstation, and idle power/mode.
- EPA will work with those manufacturers that sell higher end workstations to investigate claims that the 5 W maximum sleep mode requirement is too stringent and determine whether or not new levels, including the existing sliding scale approach, should be pursued.
- ITI and other industry members to host further discussions regarding power management.