Hello Verena and Christopher,

Below are HP's comments to the EPA's draft 1 Displays Ver. 6.0 eligibility criteria / test methods.

Bob Myers provided the technical input and I provided the input on the discussion involving expanding the ENERGY STAR program beyond product energy efficiency in the use phase.

Comments pertaining to the draft eligibility criteria:

1. HP is concerned regarding the setting of both the "off" mode and "sleep" mode limits to the same value of 0.5W. While we understand the desire to harmonize with other existing or proposed requirements, there IS a practical difference between the "off" and "sleep" modes for displays in that a display in "sleep" mode must still keep enough functional blocks powered up (such as digital video receiver circuits and/or built-in USB hubs) so that the system is able to recognize user inputs and communicate with the display to return it to the "on" state. If we are unable to provide these functions while still meeting the Energy Star requirements, such limits will have a number of unintended negative consequences. First, this would encourage users NOT to use the available power-management functions to automatically place their systems into lower-power states from which they can easily recover. Such requirements also place an undue burden on the more complex/sophisticated products which support such functions in the first place, as opposed to simpler, lower-end products which do not. It should be the priority of the Energy Star program to promote power management functions and their use, and it should be a higher priority to ensure that systems are actually placed in lower-power states as often as possible, even if this requires slightly higher power limits be established for those states.

2. Regarding the proposal to test units with their luminance set to "65% of the maximum luminance" – first, the definition of "maximum luminance" is unclear. Section 1 (D) (1) of the draft eligibility criteria defines this as "the preset picture setting in which the display is displaying the brightest on mode conditions." Is this intended to be the brightest of a set of factory-programmed preset modes (which would not necessarily be the maximum luminance of which the unit is capable), the maximum luminance which can be achieved through any setting of the user controls, the minimum specified "max. luminance" guaranteed to be within the unit's capabilities by the manufacturer, or...? The absolute maximum luminance of which a given unit is capable (along with the power consumption at that setting) can vary significantly from unit to unit of a given model or design; typically, the "max. luminance" specification stated by the manufacturer is actually the "guaranteed minimum 'max' luminance," i.e., the luminance that the product is guaranteed to be AT LEAST capable of at its maximum "brightness," etc., user control settings. The maximum luminance is also generally affected by the "white point" or "color temperature" setting selected by the user, and the product may or may not be shipped set to the "white point" which would provide the greatest luminance. In addition, "maximum luminance" capabilities may be intentionally overdesigned in some products, in order to provide greater margin for adjustment as the unit ages and the luminance at any setting naturally declines. In such cases, it would not be expected that the product would actually be used at the maximum possible luminance setting (or necessarily at a setting which has a simple percentage relationship to the maximum) for the majority of its useful life. HP feels that the previous method, testing the product at defined luminance levels which were realistic examples of how products of this class would actually be used in typical office or home lighting conditions, is a better method of determining the expected power consumption in typical usage. However, tying the luminance setting to the display resolution may no longer be appropriate, especially with the inclusion of displays in the 30-60" size range. These are very commonly digital signage displays, which will typically be operated at

higher luminance levels than a monitor in an office or home environment, and often have much lower resolution than a "monitor" display of comparable size.

3. Re Section 4, "Toxicity and Recyclability Requirements" - Consistent with the ITI position HP helped frame in response to similar proposals in the ver. 6.0 PC specifications, HP is opposed to efforts involved with expanding the ENERGY STAR program beyond product energy efficiency. The arguments HP helped develop in response to the Ver. 6.0 PC requirements (attached) apply to the EPA's proposal for the ver. 6.0 Display program requirements as well.

4. Regarding the question of how "resolution" (pixel format) affects the power consumption of display devices, HP would like to provide the following comments. At least in the currently-dominant display technology for computer monitors and televisions, namely the liquid-crystal display (LCD), the "resolution" or pixel format (in terms of H x V pixel count) does have a significant effect on the total power consumption of the display product, but not, of course, nearly to the degree that the backlight technology and the required backlight brightness will have. In terms of the direct impact on power consumption, increasing the pixel count of the display requires additional row/column driver circuits, more complexity in other portions of the display electronics (such as the timing controller or "TCON" chip), and of course for a given frame rate a higher pixel count will require that all of these, plus the interface to the display, be operated at a higher rate and therefore will consume more power. In terms of the indirect effect of increased "resolution" on power consumption, a higher pixel count for a given size of display clearly requires that each pixel be physically smaller; however, as the minimum feature size of a given production process is fixed, this generally results in a greater percentage of the pixel area being consumed by the pixel electronics and therefore not available to pass light – i.e., a reduction is the "aperture ratio" of the pixel, which will then require a brighter backlight in order to maintain the same level of front-of-screen luminance. Therefore, increased "resolution" should typically be expected to result in increased power consumption for a given display size. However, "resolution" is not the only factor here; different LCD cell technologies (e.g., TN, VA, IPS) will also provide different aperture ratios, and so will affect the power consumption at a given screen size and pixel format. Typically, the wider-viewing-angle types (VA, IPS) will require more power than TN for a given luminance level, but do provide a significant image quality improvement.

Comments pertaining to the proposed test method:

1. Re section 5.1 (testing at factory default settings), again please note the comments above regarding the luminance settings for testing. It is possible that user control settings which do not obviously affect display luminance (for example, the color temperature setting as mentioned above, or the enabling/disabling of certain features such as a "dynamic contrast ratio" function) could have a significant impact on power consumption. It would seem to be preferable that the control setting requirements reflect typical usage models. Simply leaving the requirement as "factory default settings" will just encourage the default as-shipped setup to be a minimum-power configuration, whether or not it represents typical settings in use.

2. Re section 5.2 (C) (1), "Peripherals and Network Connections," and esp. EPA's request for input on the prevalence of network connectivity, etc.: It is very important that the new requirements recognize the proliferation of new features now appearing in what have previously been simple "monitor" or "digital signage" products. These are in effect establishing new product classes which should not be compared directly to the simpler products in terms of expected power consumption. Features and functions which may be included in "monitor" products (and which clearly represent incremental added power consumption over the base monitor) include at least the following:

a. USB hubs. While the proposed test method does state that no external devices are to be connected to such a hub for testing, the hub itself will consume some power and must remain powered up even in the "sleep" modes (as the external USB devices may include user-input devices such as a keyboard or mouse, which would be used to bring the system out of the "sleep" state).

b. Network connectivity, either wired (802.3) or wireless (802.11), may be provided for a number of reasons, including basic centralized control of a number of display devices, the transmission of video (typically in compressed form) over the network, and permitting the monitor itself to act as a "smart" device (i.e., a "net monitor") with at least some capabilities such as web browsing, etc., which could be used even in the absence of a host PC system. Especially in that latter case, the "monitor" could consume significantly more power than a simple display device of comparable size/resolution, but would still be consuming significantly LESS power than the full PC system which would otherwise be in use (and so this sort of product and usage should be encouraged by EPA, possibly through the establishment of a separate product class with its own power limits).

c. The inclusion of touchscreen capability, webcams, and similar peripheral functions within the monitor. It is our understanding, however, that the provisions of 5.2 (C)(1)(v) would exclude these functions from inclusion in the power measurement IF they are configured as "off" in the default, as-shipped state.

3. Section 5.2 (C)(2)(ii) requires that "analog composite" input takes precedence over "analog component." It is unclear why this requirement is being established. The only common analog interface in PC monitor usage is the "VGA" input, which typically carries RGB component video. Some "VGA" inputs (at least, some using the common "VGA" connector) may be capable of accepting a composite signal, and some monitor products may also provide other analog inputs such as a dedicated composite video input for the purpose of TV connectivity – but these are unusual, practically never used with PC sources, and generally are not capable of supporting the full resolution of the PC monitor. HP recommends that if no digital interfaces are provided, the test method should preferentially use a standard "VGA" RGB component analog input for these products.

4. Section 5.2 (E) ("Accuracy of Signal Levels") should be explicitly stated as applicable only to analog interfaces. Digital video inputs should be expected to maintain the precise white and black level codes as appropriate for the interface in question.

5. The current EPA test method draft references IEC 62087, Ed. 2.0. This edition of the 62087 standard has been withdrawn by the IEC, in favor of Ed. 3.0 which was published this past April. Further comments from HP, if any, will assume the use of the 3.0 edition.

Let Bob and I know if you have any questions.

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Information Technology Industry Council
Leading Policy for the Innovation Economy

To: **Katherine Kaplan**
RJ Meyers
U.S. Environmental Protection Agency (EPA)

From: **Ken Salaets**
Director
ksalaets(at)itic.org

Date: **April 27, 2011**

Subject: **EPA's Proposal to Expand ENERGY STAR® Program Requirements beyond Its Core Focus on Energy Efficiency**

The Information Technology Industry Council welcomes the opportunity to provide detailed comments regarding the agency proposal referenced above. The concepts of expanding the environmental criteria and potentially regulating energy used during manufacturing (through use of Laptop PAIA) were raised during a March stakeholders meeting regarding a proposed Computer 6.0 specification

We understand, however, that the Energy Star Office has been working on this idea for some time, and has already begun adding staff with experience in areas such as product packaging that will likely be covered by such an expansion. Even so, industry remains unconvinced that there is demand for expanding ENERGY STAR® program requirements beyond use-phase energy efficiency, and reiterates our request that the agency release for public review studies, reports and any other data or resources that indicate support for moving the ENERGY STAR program for computers and other information and communications technology (ICT) products in this direction.

Our more detailed comments are below. We request that this memorandum be published on the ENERGY STAR Computer Specification web page, located at http://www.energystar.gov/index.cfm?c=revisions.computer_spec. We welcome and encourage any questions or comments that EPA or any other interested party may have regarding this document.

Executive Summary

Recently, EPA's Energy Star Office announced the agency's intent to explore the possibility of including:

1) Multi-attribute criteria (reduced toxics, recyclability/upgradeability, recycled packaging) under the Computer 6.0 specification revision.

2) Explore the possibility of using the Massachusetts Institute of Technology's (MIT) "Product Attribute to Impact Algorithm" (PAIA) methodology to develop embedded energy criteria potentially leading to inclusion of criteria regulating the amount of energy used during manufacturing ICT products.

ITI Recommendations:

In regards to multi-attribute eco-labels, industry prefers that the ENERGY STAR program continue focusing on product energy efficiency in the use phase, and not expanding the program to include other environmental attributes. Industry supports the continued use of EPEAT for addressing Multi-attribute environmental criteria. Developing a competing eco-label does not make sense, especially as EPEAT is becoming the de facto multi-attribute eco-label in the US and is gaining ground around the world. EPA should not include multi-attribute criteria or LCA based PAIA-related provisions and data collection requirements in the Computer 6.0 specification.

Regarding the MIT PAIA life cycle assessment methodology, industry supports and, in fact, sponsors MIT's PAIA model development for carbon "hotspot" identification within the supply chain, but not for product comparison.

The PAIA methodology and model are still in early development, and the data in the model are immature and do not yet accurately reflect industry manufacturing efficiencies. Consequently, products at the model level cannot be directly compared to one another for their embedded carbon emissions. Rather, PAIA's intended use is for hot spot identification within the supply chain. Secondly, the method has not yet been certified through an internationally recognized standards body. Without the standards recognition, certifying products to the methodology will be difficult.

EPA should not include multi-attribute criteria or LCA based PAIA-related provisions and data collection requirements in the Computer 6.0 specification / program requirements.

If EPA adopts multiple attributes and embedded energy criteria within the ENERGY STAR computer specification, other geographies may balk and decide to implement their own energy requirement, given that they have not established relationships with PAIA. In addition, carbon emissions vary widely by region which may result in regulators in other regions requiring different carbon calculators. Consequently, both may cause worldwide regulators to adopt separate multiple attribute models for reporting, requiring computer manufacturers to test the same configuration to numerous requirements, raising the cost of labeling compliance and meeting worldwide energy regulations. These will lead to further fragmentation in Product Energy Regulations.

Detailed Feedback to EPA

Background

Since its launch in 1992, the ENERGY STAR® program has focused on identifying and promoting energy efficient products via its voluntary labeling program. Among other things, the program covers a broad range of technologies, including office equipment, major appliances, lighting, home electronics, and other electricity-consuming products. The emphasis on energy efficiency enables EPA to publish annual estimates of reductions in greenhouse gas emissions residential and business utility bills that have been achieved as a result of the program. For example, the 2009 Annual Report highlighted nearly $18 billion in utility savings and a reduction of tens of millions of metric tons of greenhouse gas emissions through the purchase and use of ENERGY STAR-qualified products.[1] With results like these, it is not surprising that ENERGY STAR is the most widely-recognized and understood product energy guide in the world, and has been embraced by regulators and businesses around the globe.[2]

ENERGY STAR has significant worldwide brand recognition. In addition, ENERGY STAR has formal and informal partnerships with many worldwide regional energy, product, and environmental agencies including those in Asia, Europe, North America, and Australia. These partnerships offer several advantages for consumers, regulators, and computer manufacturers alike.

For consumers, ENERGY STAR is the most widely recognized and understood endorsement for electronics over any other energy or ecolabel per a recent Harrison Group study. Consumers around the world understand the concepts behind the ENERGY STAR program – products with greater energy efficiency during their use phase earn the trusted ENERGY STAR label. Research shows that other ecolabels, including those with embedded carbon or lifecycle assessment criteria, cause significant consumer confusion and consumer recognition for these programs is less than 20%. Further Harrison Group research indicates that consumers do not understand LCAs, with consumer understanding ranging from only 10-25% for a given LCA carbon input area (manufacturing, transportation, use, packaging, etc).

For environmental and product regulators having uniform global product labels allows regulators to focus on global energy efficiency priorities in the computer sector. The technical consistency in evaluation methods and assessments increases the focus on energy efficiency in the product and services deployed across the worldwide economy. Consistent methods discourage arbitrary trade barriers and focuses purely on promoting scientifically determined energy efficiency internationally.

Lastly, by designing for one set of worldwide energy specifications for their products, computer manufacturers are able to design products and "test once, ship everywhere." This design and testing philosophy enables computer manufacturers to realize significant compliance savings as testing individual systems can cost thousands to tens of thousands of dollars per investigated system. Consistent product requirements also promote product innovation as manufacturers do not need to optimize systems for regional requirements. Manufacturers can test once and ship everywhere. Varying requirements limit proliferation of innovations such as mobilized personal communication and c**o**mputing, computing virtualization, energy management, and industrial computer automation.

[1] ENERGY STAR and Other Climate Protection Partnerships 2009 Annual Report

[2] Harrison Group Consumer Science Study for The Sustainability Consortia, in draft, 2011.

1) M**ulti-attribute criteria in ENERGY STAR:**

EPA Proposal:

In addition to embedded carbon impacts, "…as the ENERGY STAR program and the marketplace mature, EPA [will] consider how it can respond to consumer interest in other environmental benefits such as lower toxicity, design for recyclability/upgradability, and recyclable packaging in their ENERGY STAR products. EPA plans to look at existing, tested industry standards for a source of such environmental criteria."

ITI Analysis and Position:

Adding requirements to the ENERGY STAR program beyond product efficiency will confuse customers. It could also discourage some manufacturers from voluntarily seeking to qualify products under ENERGY STAR. In addition, the non-efficiency requirements may conflict with regulations that have already been adopted in various jurisdictions worldwide, thereby discouraging wider acceptance of the ENERGY STAR label. Adding criteria to the ENERGY STAR program that go beyond use phase energy consumption will very likely hinder worldwide understanding of the ENERGY STAR program, create customer confusion, and potentially damage or dilute the ENERGY STAR brand.

Regarding inclusion of multi-attribute criteria in ENERGY STAR, there are already several multi-criteria eco-labels for IT products including EPEAT, Blue Angel, etc. Numerous ecolabels already exist in the market place that can be applied to computers and other ICT equipment.

ENERGY STAR's expertise lies in promoting the use of energy efficient products. Many of the existing eco labels have multi-attribute requirements similar to what ENERGY STAR is considering.

Expanding beyond energy is redundant to other multi-attribute eco-labels. Another label simply creates competing and redundant certification requirements that manufacturers must meet and consumers must understand. Adding yet another competing eco label is likely to cause customer confusion.

Additionally, other regulatory agencies throughout the world that have traditionally partnered with ENERGY STAR may begin developing their own energy specific methodologies.

ENERGY STAR stated in their February discussion document that as the marketplace matures, they will consider incorporating other "environmental benefits" into ENERGY STAR products. EPA should use its influence to improve and harmonize existing labels instead of creating a new one or expanding the ENERGY STAR program requirements.

Rather than develop separate environmental attributes under the ENERGY STAR label, ENERGY STAR should support the multiple attribute ecolabel that the EPA invested critical time and resources to help develop several years ago. EPEAT is an ecolabel for computers developed in 2006 using a grant by the EPA. The current draft revisions of IEEE1680.2 and 0.3 standards for television and imaging equipment respectively have optional criteria for product lifecycle assessment.

2) <u>EPA proposal to include the Life Cycle Assessment (LCA) based MIT's "Product Attribute to Impact Algorithm" (PAIA):</u>

Recently, staff from EPA's Energy Star Office announced the agency's intent to review and revise ENERGY STAR computer eligibility requirements. In the document entitled the "Computers Product Specification Discussion Document," released in February 2011, the agency proposed "evaluating requirements for environmental benefits outside of the energy efficiency scope," including "reporting of lifecycle energy" using the MIT-led Laptop PAIA project. The PAIA project is a consortium of industry, academia, government and non-government organizations formed to aid the ICT industry's ongoing investigation into product environmental impacts, and to help the industry develop efficient, resource-sensitive and actionable sustainability strategies. The initial PAIA model is focused on understanding carbon emissions throughout the product lifecycle of notebook computers and identifying processes and components that result in the greatest emissions. Algorithms are then developed that map the most impactful product attributes to carbon emissions.

In the February document, EPA indicated its intent to investigate ICT product processes and characteristics in order to improve supply chain environmental performance. By expanding the ENERGY STAR program into the so-called embedded energy of laptop computers, EPA hopes to "guard against unintended consequences where (it) recommends a product based on use phase data exclusively." The agency indicated its intent to "propose consideration of the results of the laptop PAIA project in the V6 specification.

<u>Background</u>

ICT products are complex and subject to high turnover in manufacturing, assembly and the supply chains used to procure essential materials and components. In the time it takes to develop accurate inventories of materials, energy and emissions for a particular product, the data may no longer be accurate. However, developing tools to assess environmental performance is critical to addressing product impact. In order to effectively characterize notebook computer impacts, the MIT PAIA researchers are developing tools that map product characteristics to carbon emissions through analysis of generic ICT products.

Specifically, the product attribute impact algorithms endeavor to relate the characteristics (or attributes) of ICT products to their prospective carbon "impact." These algorithms are based on proxies for generic products and product components that link a set of product attributes (e.g., type of display module, type of memory) to a bill-of-materials and process for each product, ultimately producing a hypothetical mapping to the resulting carbon footprint. The resulting methodology is intended to allow users to estimate the product carbon footprint (PCF) based on relevant design criteria. These flexible carbon footprinting tools will help the ICT industry identify "hotspots," i.e., those processes and components that have the biggest impact on the lifecycle carbon footprint of a product family. However, the tool and its resulting impact calculations are <u>not</u> analogous to conventional ENERGY STAR metrics because the model results are from generic data and aggregated supplier data v. manufacturer-specific product data, such as TEC calculations.

<u>ITI Analysis and Position:</u>

There are a number of factors that dissuade inclusion of embedded energy under the Computer 6.0 energy specification:

Technical Issues with Adding Embedded Carbon Criteria to ENERGY STAR

Carbon "footprinting" methodologies are still in early development:

The data used in such models is immature and does not yet accurately reflect industry manufacturing efficiencies. Consequently, product "embedded" carbon emissions at the model level cannot effectively be compared to one another. Although further along than other methodologies for determining the relative carbon footprint of ICT products, PAIA still does not allow for direct product comparisons. Rather, PAIA's intended use is for hotspot identification within the supply chain. Also in regards to PAIA specifically, the methodology has not yet been certified by an internationally-recognized standards organization. Without such recognition, certifying products to the methodology will be difficult and potentially inconsistent

Hotspot Model - Incomplete Data / Lack of Global Standards:

Industry supports PAIA emphasis on supply chain "hotspots" and is actively partnering with the MIT team to develop the methodology. The "hotspot" model will enable manufacturers to identify the most impactful components or processes within a product's carbon footprint, and thereby help us determine where to focus attention and resources to improve supply chain efficiency. Currently, PAIA is mature enough to identify broad hotspots (e.g., LCDs, motherboards). However, current carbon footprinting methodologies, including the PAIA approach, are unable to identify detailed underlying drivers behind these impacts, due in part to a lack of data. Once data are improved and the underlying drivers behind the environmental impact of ICT products are fully understood, industry will support the use of PAIA to drive efficiencies within the supply chain.

At present, the current inadequacy of data and the lack of global standards for data collection and methodology usage preclude effective utilization of carbon footprinting methodologies, particularly as a component of the ENERGY STAR Computer 6.0 specification. Though the preliminary laptop computer hotspots identified using PAIA are not likely to change, the data behind PAIA (and other carbon footprinting approaches) have a great deal of uncertainty. At this time, discerning the key drivers impacting the supply chain is difficult. The MIT researchers are continuing to refine the model, as well as expand it to include additional modules and impact criteria. Nevertheless, current uncertainty hinders PAIA's ability to be used in ENERGY STAR where individual product impacts are being compared. Other factors would also hinder adoption:

- Much of the current data available for use in carbon footprinting tools such as PAIA are generic data which could be out-dated. Given that technology generations usually turn over every 18-24 months, the databases do not reflect industry improvements in materials and processing efficiencies.
- Data collected from the suppliers may not capture all manufacturing impacts as only data from the limited suppliers that responded to questionnaires were included in the algorithm analysis. The model can therefore be greatly impacted by data sources.
- Supplier data collection and reporting are in their infancy. Suppliers need to be better educated on completing carbon questionnaires, especially when it comes to applying product allocation. In addition, industry is still defining accurate data collection including allocation so reporting recommendations have not been vetted. Ideally industry needs to develop a standard for measuring and reporting supplier data so that data are accurate and consistent.

Once an international standard for measuring and reporting has been developed and certified, established ecolabels would become good candidates, as opposed to energy regulations, to begin adopting carbon lifecycle analysis.

Problems with Direct Application

An alternative to the hotspot application would be to use carbon footprint calculators to directly compare results between similar products. Industry does not support regulators using carbon footprinting calculators, including PAIA, to directly compare footprint results. Current carbon footprinting models are not mature enough to yield comparable results beyond the product use phase for several reasons:

- Carbon footprinting calculators currently rely on standardized values, aggregated supplier data and generic data for manufacturing phase impacts. Because current component data are for standardized, products with similar attributes (screen size, battery type, etc) the output will result in similar calculated PCF values, making direct comparisons moot.
- Carbon footprint calculators have significant uncertainty in the results, making it difficult to compare products directly. There are a number of research studies that support the position that lifecycle analysis (LCA) methodologies are not mature enough to yield valid comparisons between products.
    - This conclusion was made in a study called the German PCF Pilot Project which stated: "Providing a total CO_2 footprint figure in the form of a static carbon label, as is already practiced by some companies, does not make sense and is not very relevant for consumer decision making. A figure of this kind suggests a precision and conclusiveness which cannot be achieved using the current state of methodology".[3]
    - Another study performed by ANEC in 2010 concluded that "a static PCF stand-alone label providing a total CO_2 footprint on products does not make sense and is not very relevant for consumer decision making".[4]

PAIA is one of the few carbon footprint tools that has focused on identifying footprint uncertainty and is currently concentrating on improving data to reduce uncertainty. However, obtaining sufficient enough data to enable product differentiation using a carbon tool is two or more process generations away at the earliest.

As mentioned earlier, the main purpose of PAIA is to help the industry as a whole develop efficient, resource-sensitive and actionable sustainability strategies by identifying hotspots along its supply chain. ENERGY STAR's intent to use PAIA or other carbon footprint tools to make supply chain improvements does not match the intent of ENERGY STAR, which targets individual products. Industry believes that the best way to use PAIA, once it is mature, is within an existing, voluntary multi-criteria eco-label.

PAIA Tool Not Yet Certified:

[3] http://www.pcf-projekt.de/files/1241103260/lessons-learned_2009.pdf

[4] http://www.anec.eu/attachments/ANEC-R&T-2010-ENV-001final.pdf

Beginning in January 2011, ENERGY STAR began requiring third-party certification of all products through ISO/IEC 17025 and EPA-recognized labs prior to qualification and labeling. Proving compliance to planned ENERGY STAR "environmental benefits" could be difficult given that carbon footprint methodologies are still in development and the data within these models need further refinement. As mentioned above, data sources in these models are either from older technology data bases or from supplier questionnaires. MIT researchers are currently working on improving the data quality to ensure more accurate results within the PAIA tool. They also have plans to certify the model through an international global standards organization.

The PAIA methodology is a streamlined method for estimating the carbon footprint of ICT products. Because of this, the PAIA methodology and supplier data reporting do not fit under the current worldwide carbon footprinting standards - ISO 14067, PAS2050 and the GHG Protocol. PAIA is in the process of understanding what needs to be done to comply with PAS 2050 but until that is completed, PAIA methodology should not be used by ENERGY STAR or other regulatory bodies. Issues surrounding use and/or licensing of the PAIA methodology also need to be resolved before it is used within an international regulatory standard or label. Without verification and public use of the model, the "environmental benefits" cannot be independently verified as required by ENERGY STAR. Following MIT PAIA-method standardization, EPEAT or a similar multi-attribute label could adopt PAIA reporting as part of its labeling criteria as opposed to ENERGY STAR.

Looking Ahead: Future PAIA, LCA and EPA Partnerships

Even though PAIA is not ready to be used to develop rigorous regulatory criteria, the EPA's continued support and involvement in PAIA development would benefit both in multiple ways:

- EPA's influence can assist the PAIA project in its collaboration with similar worldwide efforts such as the French mobile phone eco-label development. With more worldwide support and involvement it will become easier to obtain necessary data and achieve supplier support.
- PAIA's biggest obstacle is the lack of accurate data. Questionnaires and standards for obtaining supplier data are large obstructions to product carbon footprinting efforts in the embedded phase. It would be beneficial to all PCF and LCA efforts if EPA focused on driving data reporting throughout the industry. ENERGY STAR and EPA could then use their influence to drive global standardization for collecting and reporting embedded product energy.
- Once carbon footprinting and LCA initiatives reach the point in development where they will yield meaningful and comparable results that can be reported through global standards, the outputs of these LCA tools should be considered for inclusion into eco-labels and standards. The most appropriate standards for such data are those that are intended to be multi-faceted from their inception, such as the IEEE 1680 EPEAT environmental labeling scheme and other multi-criteria environmental standards that may include carbon footprinting.

Note re IEEE 1680.1 EPEAT Standard:

The industry anticipates that the IEEE1680.1 revision 2 of EPEAT for notebooks and desktop PCs will likely have similar LCA and carbon footprinting requirements. In addition, EPEAT has a significant global registry for PC computers, covering a large number of products from a broad range of manufacturers, allowing manufacturers to design and "test once, ship everywhere". Over 45 system manufacturers are already familiar with the EPEAT program and have invested time and significant

resources to register more than 3,200 products in 41 countries under the EPEAT requirements. Furthermore EPEAT has a verification program for labeling. The ENERGY STAR program should focus its efforts to promote “environmental benefits” in the revisions of IEEE1680.1 rather than develop new criteria within the ENERGY STAR program.