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The following IPC comments were submitted electronically to EPEAT (a partnership of EPA, Green Electronics Council and Zero Waste Alliance) regarding the development of the EPEAT Standards Development Roadmap (SDR). EPEAT is an environmental procurement tool designed to help institutional purchasers in the U.S. public and private sectors evaluate, compare and select electronic goods, based on their environmental attributes. For more information on EPEAT, visit their website at http://www.epeat.net. For more information about the SDR, go to http://www.zerowaste.org/epeat/roadmap.htm.

April 30, 2007

IPC - Association Connecting Electronics Industries - is the national trade association for the electronic interconnection industry, and represents more than 2,400 member companies involved in the manufacturing and assembly of printed circuit boards. Printed circuit boards and electronic assemblies are used in a variety of electronic devices that include computers, cell phones, pacemakers, and sophisticated missile defense systems. On behalf of our members, IPC is pleased to submit the following comments on the Electronic Product Environmental Assessment Tool (EPEAT) Standards Development Roadmap (SDR).

IPC is concerned that the proposed roadmap contains misleading information and inaccuracies. To accurately accomplish its mission, EPEAT criteria must be based on the true lifecycle impacts of the selected products. Criteria based on incomplete and inaccurate data may have the unintended consequence of causing a negative environmental impact.

The proposed roadmap contains many incorrect and unsubstantiated statements regarding Brominated Flame Retardants (BFRs). BFRs are a family of 75 chemical substances with different properties, characteristics, and performance. The only commonality is that all BFRs contain bromine – an element that is available in nature. While environmental and health concerns have been raised about certain BFRs, such as Polybrominated Biphenyls (PBBs) and and Penta- and Octa-Polybrominated Diphenyl Ether (Penta- and Octa-PBDE), industry has responded by removing them from products. Others BFRs, such as Tetrabromobisphenol-A (TBBPA) and Decabrominated Diphenyl Ether (Deca-BDE), have been thoroughly tested and found to have no identified risks or negative impacts on human health. It is therefore inappropriate and misleading to repeatedly make blanket statements such as, "Also likely to contain brominated flame retardants that may be hazardous to human health."

In fact, removal of all BFRs could have a significant negative impact on human health. BFRs are added to plastics used in electrical and electronic equipment (EEE) to slow

down or prevent the ignition of fire. Flame retardants, when used in EEE, save lives and reduce property damage by preventing the spread of flame and fire. Because the very function of printed circuit boards is to transmit electrical charges, fire retardant is an absolute necessity. Fire statistics suggest that the risk of death or injury from fires involving consumer products can be reduced 30 to 90 percent or more by using flame retardants.

The SDR also makes repeated references to TBBPA as a toxic material, such as the statement in 3.1.2, "Toxic materials likely found in cell phones sold today include (Socolof, 2007)…BFRs- tetrabromobisphenol-A (TBBPA) and decabrominated biphenyl ether (DBBE)." TBBPA is the primary flame retardant used in printed circuit boards. There is no data indicating that TBBPA presently used in printed circuit boards present any significant environmental or health hazard. In fact, because TBBPA is reacted into the epoxy resin matrix of the printed circuit board base material, it no longer exists as an isolatable chemical in the final product.

TBBPA is currently going through the EU Risk Assessment process. The Human Health section of the Risk Assessment was closed in 2005 with no risks identified. The Scientific Committee on Health & Environmental Risks and a study from the University of Würzburg (under the EU Fire project) also confirmed these conclusions. The Environmental section of the Risk Assessment was closed in March 2007. No risk was identified for TBBPA when used as a reactive, such as in the epoxy resins of printed circuit boards.

Deca-BDE, one of the flame retardant chemicals used in a variety of electronic applications, has been the subject of extensive scientific reviews by the National Academy of Sciences, the Consumer Product Safety Commission and a 10-year risk assessment by the European Union. None of the findings from this work supports restrictions or prohibitions on the use of Deca-BDE in these applications. Based on the EU Risk Assessment, an ongoing process under which Deca-BDE is subject to regular review by the EU, Deca-BDE has been exempted from regulation under the EU RoHS (Restriction of Hazardous Substances) Directive.

This being said, non-halogenated alternative fire retardant material systems are being developed and introduced into products. These systems typically use nitrogen compounds, phosphorus based compounds, aluminum hydroxide, or a combination of these. Some of these may be incorporated into the backbone of the polymer as is done with TBBPA in epoxy. These flame retardant systems are currently available for some printed circuit boards and engineered plastic applications. It is important to note that the reliability of many alternative flame retardants has not been fully qualified at the assembly level.

There is also no data indicating that any of the materials currently being considered as replacements for these halogenated flame retardants are any better or worse for the environment or human health. Significant research is needed before BFR substitution can occur on a broad basis. In additional to assessments of the flame retardant systems'

effects on product functionality and reliability, it is necessary to evaluate the lifecycle impacts (design, use, and end-of-life) of the substitutes, as compared to the BFRs currently in use. For many of the potential substitutes, it is not currently clear whether the alternatives are truly better for the environment or human health.

For example, concern has been raised over the use of antimony trioxide as an alternative flame retardant due to its potential human toxicity. Elimination of BFRs will generally eliminate the use of antimony trioxide because it is typically used as a synergist with the bromine generated from the flame retardant compound. In some cases, antimony compounds are also added as a pigment. Most printed circuit board structures do not contain antimony trioxide as part of the flame retardant package; however it is commonly used in integrated circuit encapsulants. Engineering plastics, particularly those that are connected to a continuous source of power such as line current can contain antimony trioxide. The use of antimony in metal alloys is not a current topic of regulatory concern. A risk assessment of antimony trioxide is currently underway in the European Union.

To investigate the environmental, health and safety aspects of alternative flame retardants for printed circuit boards, the US EPA is leading a multi-stakeholder partnership through the EPA's Design for the Environment (DfE) Program. The goal of the project is to identify and evaluate commercially available flame retardants and their environmental and human health and safety aspects in common printed circuit board materials. The partnership will incorporate lifecycle thinking into the project as it explores the potential hazards associated with flame retardants and potential exposures throughout the lifecycle of flame retardants as used in FR-4 printed circuit boards. More information on this project can be found at the EPA website: http://www.epa.gov/oppt/dfe/pubs/projects/pcb/index.htm.

The SDR also makes incorrect statements regarding the legal status of TBBPA. The repeatedly used statement, "Both the printed wiring board as well as the case of the phone are likely to have brominated flame retardants (BFRs) most of which have been banned or are under consideration for banning" is completely false in regard to TBBPA. There are no regulations in the U.S. or elsewhere that ban TBBPA, which is a BFR. As previously discussed it is highly inappropriate to discuss an entire class of chemicals, in this case BFRs, when the stated issue refers to only a few specific chemicals in this class. This statement should be modified to list the specific BFRs that have been banned, PBBs and Penta- and Octa-PBDE.

Public safety is a paramount concern for electronics manufacturers. The use of flame retardants in electronic equipment is paramount to the fire safety of these products and their use should not be discouraged. Until relevant and scientifically validated data are presented proving that the TBBPA and Deca-BDE have an adverse environmental impact and the alternatives are better, all reference to these substances should be withdrawn from use as an EPEAT environmental criterion.

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