

**DRAFT SUMMARY OF THE NEPSI DESIGN WORKSHOP**  
**Tampa, FL**  
**January 23, 2002**

The NEPSI Design Workgroup held a workshop for several hours during the afternoon of January 23<sup>rd</sup> as a precursor to the NEPSI stakeholder meetings in Tampa. The workshop, which was open to all NEPSI stakeholders and observers, featured presentations on electronics design issues, as well as discussion among the workshop participants. This document summarizes the presentations and the major topics covered during the discussions.

## **INTRODUCTION**

David Stitzhal of WEPSI and the Northwest Product Stewardship Council welcomed the participants and described the history behind the workshop. Stitzhal explained that, during the original NEPSI stakeholder meetings, an ancillary workgroup had been formed to discuss how design issues should be addressed in the NEPSI process. This workgroup had subsequently decided to hold workshops where producers and other stakeholders could present work being done on DfE issues.

## **PRESENTATIONS**

### **Brad Allenby, AT&T**

Brad Allenby, EH&S vice president at AT&T, gave a keynote presentation on takeback policy goals, touchstones for design decisions, and drivers for DfE. He opened his presentation by remarking that design is a unique human activity that shapes our lives. Design is an extraordinarily complex activity that has to integrate cultural, economic, and technical factors. As you strive to improve design, Allenby said, it is not possible to make improvements in one dimension without affecting others. Because of these complexities, there are always tradeoffs. For example, bismuth solder is a substitute for lead solder. However, bismuth as a raw material is a by-product of lead mining. Further, using bismuth solder requires a cleaner substrate, which necessitates the use of chlorinated solvents.

Allenby explained that the design process includes objectives and constraints. Objectives are the characteristics that are desired, while constraints are prohibitions or technological barriers. Both are influenced by customer preferences, government regulations, and other factors. To change design, one must know the process and the products. Allenby noted that AT&T chooses to use process specifications rather than technical specifications when pursuing design changes.

Since the design cycle can encompass several years, adequate lead time is needed to make improvements that require design changes. Takeback systems do encourage DfE, as do procurement requirements. If an immediate change is required, however, then regulation, such as material bans, may be necessary. The existence of regulations definitely elevates the priority given to environmental design considerations, Allenby

said. A corporation gives less priority to environmental characteristics when they are simply strategic design objectives.

Allenby pointed out that environmental objectives have been achieved in some instances as product designs have evolved. For example, digital photography eliminates material use (film) and avoids the pollution associated with film processing. Some technological innovations whose objectives were driven by cost efficiency also have resulted in environmental improvements, such as computer analyses that determine the most efficient delivery routes for Fed Ex, for example.

He presented a list of impacts he felt were associated with the use of product takeback:

- Potential decrease in consumption because of a likely increase in product price.
- Slow down of technological evolution.
- Internalizing costs, creating an incentive for improved product design.
- Creating trade barriers and a targeted competitive advantage (if reverse logistics systems are brand specific).
- Eliminating or reducing negative health effects associated with disposal of electronics.
- Encouraging recycling in general or with targets.
- Reducing solid waste volume.

Allenby closed by presenting a long list of touchstones for design. He emphasized, however, that the three key considerations were product quality, cost, and time-to-market. The text box below lists some of the other items.

<b>Touchstones for Design</b>	
Quality, cost, time-to-market	Aesthetics
Customer desires	Adaptability
Stakeholder desires	Testability
Ease of use	Universality
Cultural changes	Simplicity
Patent/copyright	Interfaces
Legal/regulatory	Prototype
Environmental impact	Model scale-up
Manufacturability	

### **Heather Bowman, EIA**

Heather Bowman of the Electronics Industry Alliance gave an overview of EIA's Product Ecology Initiative to help member companies incorporate DfE principles.

Bowman said that EIA's efforts include:

- Development of a materials declaration guide that can be used as an industry-wide supply chain questionnaire. It can be a template for chemical disclosure and will help identify materials that may effect EOL management of products.

- Involvement in EPA's Energy STAR Program.
- Work being done by EIA's dedicated DfE committee.
- Public/private partnerships with EPA on lifecycle analysis.
- Creation of a compendium of DfE efforts by member companies.

Bowman described some of the challenges that face producers incorporating green design principles into their products. Alternative designs and materials take time to test, Bowman said, and there is the question of who decides what is better. Producers must also address potential effects that design changes can have on product performance and durability. Regarding the use of recycled materials, there's the question of how many times the materials can be used.

Bowman said that the benefits of DfE include the conservation of raw materials and natural resources, diversion of materials from the waste stream, energy conservation, and reductions in the use of chemicals of concern.

Bowman gave some examples of DfE work being done by electronics companies, including Sharp's efforts to reduce materials usage, Hewlett-Packard's and IBM's use of recycled materials in products, and Pitney Bowles' DfE training program for design engineers. She concluded by saying that EIA is proud of the progress being made to minimize environmental concerns associated with electronics products. She said that companies would continue to be proactive in the areas of research and design.

### **Doug Smith, Sony**

Doug Smith of Sony described work that his company is doing in the area of product design. He began with a list of Sony's design goals, which include:

- Exceed customer expectations.
- Improve lifestyles through innovation.
- Let engineers be their best.
- Be competitive in price.
- Lower costs to consumers.
- Reduce raw materials costs.
- Integrate features.
- Miniaturize.
- Develop multi-function products.

Smith said that Sony is always trying to refine its products, particularly by reducing their size and reducing costs.

He talked about Sony's participation with Waste Management, Panasonic, and the state of Minnesota in a pilot project to test the economic viability of various collection strategies for waste electronics and to evaluate scrap markets for secondary materials

generated by this product stream. He reported that 8 percent of the material collected could not be recycled.

As an example of Sony's DfE efforts, Smith explained some of the changes that Sony has made to its television design. These include eliminating paint, using a lead-free panel, using recycled glass, reducing the use of plastics and materials, using recycled plastic in the speaker box, and switching to lead-free solder. He said that the speaker boxes in Sony televisions are now made from recycled agricultural trays. Since 1999, Sony has used 6,000 pounds of these recycled trays per year. Also, the company has begun using packaging materials made from recycled magazine material.

Smith went on to talk about the opportunities for reusing glass and plastics from electronics waste. He said that U.S. glass plants could absorb 5 to 10 times the current end-of-life volume. He also said that recycled plastics from e-waste are usable and valuable but very difficult to incorporate into products because of variations in standards and specifications.

Sony's plan for the future is to push green design, maximize the value of recycled content, find ways to get reclaimed content back into products, and avoid inflated prices.

### **Tim Mann, IBM**

Tim Mann of IBM described his company's Environmentally Conscious Products (ECP) program. IBM has a corporate-level Environmental Management System (EMS) as well as division/operations-level EMSs.

Mann said that IBM's commitment to environmentally conscious products is outlined in the company's corporate environmental affairs policy statement:

“To develop, manufacture and market products that are safe for their intended use, efficient in their use of energy, protective of the environment and that can be reused, recycled or disposed of safely.”

The corporate targets for design improvements are energy efficiency, use of recycled materials, powder coatings, and materials reutilization from asset recovery. He described some of the DfE tools used by IBM, including the company's corporate standard for environmentally conscious design. The standard provides guidance on:

- Materials – prohibited substances, packaging, manual/publications, use of recycled materials.
- Design for reuse and recycling – modularity, upgradeability.
- Energy efficiency – Energy Star and Japanese requirements
- Batteries – labeling, content restrictions

- Acoustics.
- Chemical emissions.

Other design tools used within the ECP program include DfE assessments (qualitative ranking of a product's environmental attributes), product environmental profiles (which document key environmental characteristics of products), and life-cycle assessment (used selectively for materials selections).

Mann presented a case study of how IBM is designing some products for ease of disassembly. Using a slide show, he showed the steps involved in disassembling one of IBM's servers.

Mann concluded by saying that IBM actively works to improve the environmental attributes of its products. He said that significant drivers already exist for improved designs (cost/performance improvements, customer requirements, repair/maintenance), and that end-of-life management is an important consideration in new product designs. DfE reduces the total cost of any takeback system and makes new products more affordable to customers. However, Mann said, it would be difficult in a national system to reward individual manufacturers for their DfE efforts since it would be too costly to return the products to their original manufacturer. DfE is less important for products that have a long life, because the technology and use of materials would have changed too much for the recycled materials to be valuable. Also, Mann relayed that the less value there is in the recovered products, the harder it is to justify disassembly and recycling. This is especially true when considering that the collection and transportation costs would comprise the largest share of total recycling system costs.

#### **David Thompson, Matsushita/Panasonic**

David Thompson's presentation focused on the product assessment process that is in use at Matsushita/Panasonic.

Thompson began by talking about Panasonic's commitment to improving end-of-life management of electronics. He said that the company had participated or provided funding for a number of pilot projects, including the Connecticut resource recovery program, the Minnesota asset recovery program, and Best Buy's collection events.

Thompson went on to describe the ongoing development of Matsushita/Panasonic's product assessment system, a software system that is used internally to examine environmental impacts across the lifecycle of a product. He said that the company began in 1991 by introducing an assessment system focused on resource conservation. Since then, the system has been expanded several times to focus on energy savings, chemical substances, and green procurement. (Upgraded versions of the system were introduced in 1993, 1995, 1997, 2000.)

Thompson said that the product assessment system is used within the company to assess the environmental impacts of products during the planning, design, and development

stages. Designers use the system from the moment they begin to conceptualize a new product. The system is also a key tool for evaluating whether products meet the requirements of the company's "Green Product" standard (an internal product certification program). The system assesses life-cycle energy use, chemical use, recyclability, ease of disassembly, uniformity of materials, reusability and number of components, volume of materials, longevity, potential for upgrade, recycled content, and EOL considerations.

Thompson demonstrated the system, showing some of the assessment inputs and what the final assessment sheet looks like. He explained that the results are compared to the results for previously designed products to measure the degree of improvement achieved. He also mentioned that the company was developing the Matsushita Product Assessment Support System, a database of environmental information to help designers evaluate products.

Thompson pointed out that it is useful to harmonize around DfE design objectives, because members of the supply chain are receiving many different inquiries and specifications from the manufacturers.

### **Clare Lindsay, EPA**

Clare Lindsay gave an overview of the EPA Design for the Environment Program's activities related to electronics.

She said that the vision behind the DfE program is to have business decision-makers integrate environmental concerns with cost and performance criteria. The DfE program's approach to achieving this vision is to:

- Form partnerships with an industry *sector*, including industry leaders, trade associations, research organizations, and public interest groups.
- Use a customized approach for each partnership.
- Develop substitutes assessment of relative risk, performance, cost, and water and energy use of baseline and alternatives.
- Achieve risk reduction through pollution prevention.

Lindsay said that the DfE program has partnerships with numerous industries, with over 200 partners in all. The goals of each partnership project address process changes, product design, and workplace practices.

Lindsay described the DfE program's Computer Display Partnership with the electronics industry and other groups, looking at the life-cycle environmental impacts, performance, and cost of technologies that are used in desktop computer monitors—namely, CRTs and liquid crystal displays (LCD). She said that the goals of the project are to:

- Encourage the use of displays, materials and processes that pose less impact on the environment.
- Help meet growing global demands of “extended product responsibility.”
- Identify environmental challenges that can be addressed in the future.

Lindsay said that potential areas of improvement for LCDs include reducing chemical risk (e.g., mercury in backlights), lowering energy usage in manufacturing, reducing greenhouse gases (SF<sub>6</sub>) and aquatic pollution in manufacturing, and developing end-of-life management strategies for products.

Lindsay went on to talk about the DfE program’s efforts to develop a new partnership focused on solder. She said that manufacturers are phasing out the use of lead in solder, and there is a need for detailed evaluation of the life-cycle impacts of lead solder and its alternatives, including impacts associated with materials acquisition, manufacturing, use, and disposal. For alternative solders, there are also design challenges that need to be addressed.

Lindsay concluded by mentioning some other EPA activities focused on electronics design, such as the Region 9 Roundtable on brominated flame retardants and the work being done by the Office of Solid Waste, in partnership with Regions 5 and 9, to characterize toxics in electronics and the degree to which these toxics may be released during disposal or recycling.

## **SUMMARY OF DISCUSSION AMONG WORKSHOP PARTICIPANTS**

Following the presentations, the workshop participants held an open discussion about design issues. The discussion topics posed by the facilitator, David Stitzhal, included: questions for the presenters, the role of government in driving design changes, and ways that design issues could be addressed in the NEPSI process.

A participant opened the discussion by asking the presenters from OEMs if contract manufacturing has any impact on DfE efforts, and whether DfE improvements can be undermined during the actual production process. Tim Mann (IBM) and David Thompson (Panasonic/Matsushita) explained that OEMs outsource manufacturing but not design, so they control DfE. Also, contract manufacturers would be unlikely to change a product specification without approval.

Another participant noted that the product assessment system being developed by Panasonic/Matsushita doesn’t seem to apply a hierarchy so that engineers prioritize reusability over recyclability in design. He asked the OEM presenters if there was a reason for this, and whether it was generally true. They responded that reusability is a focus, but more for high-end products than for PCs. In general, they said, it’s not cost-effective to refurbish or repair cheaper products—maybe anything under \$100 or even \$300.

Sony's Doug Smith was asked about OEMs' ability to use plastics from old televisions in new televisions. He said that there are a lot of variables. For example, if Sony stops using plastics that contain brominated flame retardants, then a whole class of old plastics will not be reusable or recyclable.

EPA's Clare Lindsay asked the OEM presenters whether they thought the impacts from electronics regulations in Europe and Japan would migrate into the United States and affect U.S. consumers. In other words, would these regulations affect the kinds of products that are used and disposed of here? Tim Mann said he thought that the same improvements being incorporated in Europe are also being used in the United States. He stated that products are built for the world market, but advertising may not focus on environmental attributes in countries where consumers don't demand it.

Another participant said he thought that improvements overseas could lead to harmonization upward (rather than downward, as is often argued by those opposed to globalization). However, he said that he was troubled that U.S. trade associations have fought against the WEEE regulations. In his opinion, regulations are the main incentive for phasing out the use of toxics in electronics, and it is worth considering the idea of linking toxics content to takeback requirements.

Tim Mann agreed that regulations do have a place in driving design improvements. However, he said that materials bans must be used carefully. Another participant said that it would be impossible to make broad demands on removing toxics from all electronic devices, since all electronics are not equal. For example, a ban on lead use in electronics would be ill advised, since lead-free solder doesn't work equally well in all electronics, from cell phones to notebook computers to mainframe computers to vacuum cleaners.

The workshop participants used the remaining time to brainstorm ways of addressing design issues as part of the NEPSI process. The participants came up with the following list of ideas:

- Hold another design workshop to allow more OEMs to share information on DfE initiatives.
- Encourage feedback and information sharing from recyclers to designers (and vice versa).
- Address the importance of Federal agency procurement policies and their role in providing incentives for DfE.
- Identify and develop alternative uses for recycled equipment and recovered materials.
- Share best-design practices with the OEM community at large.

- Get green design information to consumers.
- Develop a “leaders and laggards” list of OEMs who are and are not using green design practices.
- Develop a ratings system for DfE and EOL attributes of products.
- Initiate a subgroup whose purpose is to provide design input into the NEPSI subgroup (i.e., financing, infrastructure, and regulatory) work products.