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ELECTRONIC WASTE

HEARING

BEFORE THE

SUBCOMMITTEE ON
SUPERFUND AND WASTE MANAGEMENT

OF THE

COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

ONE HUNDRED NINTH CONGRESS

FIRST SESSION

JULY 26, 2005

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COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED NINTH CONGRESS

FIRST SESSION

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C O N T E N T S

ADDITIONAL MATERIAL

ELECTRONIC WASTE

TUESDAY, JULY 26, 2005

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON SUPERFUND AND WASTE MANAGEMENT,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:30 p.m. in room 406, Senate Dirksen Building, Hon. John Thune (chairman of the subcommittee) presiding.

Present: Senators Thune, Inhofe, Boxer and Jeffords.

OPENING STATEMENT OF HON. JOHN THUNE, U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA

Senator THUNE. The hearing will come to order.

I want to welcome our panelists and say good afternoon.

We are here this afternoon to hear testimony from various stakeholders concerning an issue that has been receiving an increased amount of attention as various States begin to grapple with the disposal of obsolete, electronic devices. Not only is the topic new to this committee but it also marks my first hearing as subcommittee chairman. As this hearing gets underway, I want to thank my fellow subcommittee members for joining me today and look forward to working with them in the future regarding this and other issues under our subcommittee's purview.

According to the Consumer Electronics Association, Americans own some 2 billion electronic products, about 24 products per household. Though e-waste constitutes less than 1.5 percent of municipal solid waste, it is piling up at three times the rate of other household trash according to the EPA. Like many American families, I am sure that there are a majority of folks in the hearing room today who have older televisions or computers sitting around their homes because they just don't know what to do with them.

While some interest groups claim that electronic waste such as TVs, computers and computer monitors pose a significant risk to human health due to the presence of toxins such as lead, mercury and cadmium, I look forward to hearing more from the EPA and other witnesses about the risk if any that electronics pose to the general public when disposed of in municipal landfills.

While it is currently possible for older electronics to be recycled in hopes of recovering precious metals such as gold, copper, aluminum and platinum, the latest estimates from the Environmental Protection Agency show that consumers only recycle roughly 10 percent of all electronics. The remaining 90 percent of used con-

sumer electronics are in storage, disposed of in landfills or incinerators or exported for reuse or recycling.

I also look forward to hearing from our third panel which represents various stakeholders from the retail, manufacturing, recycling and environmental sectors. Particularly, I am interested in learning more about what each of our witnesses think of the emerging patchwork of States' e-waste initiatives and what it means to not only the future of collection and recycling but also what impact the differing State e-waste initiatives mean to the U.S. economy and the competitive position of the U.S. electronics industry.

Before turning to our first panel, I would like to recognize Senator Boxer, the Ranking Member of our subcommittee for her opening statement. As many of you may know, California has placed a ban on electronics from the landfill and has created its own statewide program regarding e-waste. As I discovered in preparation for this hearing, it seems this issue is very similar to layers of an onion, the more you learn, the more complex it becomes.

I would be happy to yield to the Senator from California, Senator Boxer.

Senator BOXER. Thank you so much, Senator, for holding this hearing and I am very grateful to our colleagues on our first panel and look forward to their remarks.

I would like to read an opening statement. It will last around 5 minutes. Is that OK?

Senator THUNE. That is fine.

Senator BOXER. I see that the chairman of the full committee is here. I am very happy to see you, Senator.

Senator INHOFE. Would you mind yielding to me for just a moment?

Senator BOXER. No, I would not mind.

Senator INHOFE. Thank you, Senator Boxer.

We are this close to finishing up our highway bill.

Senator BOXER. I had that feeling when I looked at your face.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. So I cannot spend a lot of time here but I wanted to come by and just briefly say, first of all, congratulations to Senator Thune. This is your first chairmanship and your first meeting of your chairmanship and there is no more important subcommittee than the one you have. Being the home of the most devastating of all superfund sites, Tar Creek, it is one I am very sensitive to the issues before this committee.

I would say this is a very significant issue and you are diving into a very complicated issue at this time. I know that you and Senator Boxer will be able to handle this. I applaud both of you for giving it your attention.

I would ask unanimous consent that my formal statement be made a part of the record at this point.

Senator THUNE. Without objection.

Senator INHOFE. Thank you.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

I would like to take a moment to congratulate Subcommittee Chairman Thune on his first hearing. Senator Thune has already demonstrated a great ability to consider legislation and balance the interests of diverse groups of stakeholders. I am confident that as Chairman of the Subcommittee on Superfund and Waste Management, he will lead on several important issues facing our Nation.

I must say, Mr. Chairman, you are certainly diving right into a big issue with today's hearing. The issue of electronics waste and recycling has become one that a lot of people talk about but have had difficulty in defining what the problems are much less potential solutions.

Various interest groups and European Nations have been pushing for laws restricting electronics waste and require recycling. A handful of States have passed or are contemplating legislation that adopts differing regulatory approaches.

Enacting environmental regulations cost money, and the subject of funding various e-waste and recycling programs is one of the bedrock issues of today's hearing. In reviewing the various approaches and responses from individual stakeholders one thing is clear: the issue of electronics waste and recycling has tremendous impacts on the competitiveness of companies.

The electronics industry is one of the most price sensitive, and shifting compliance costs may have serious consequences that could jeopardize a business's future. Congress should take care in proposing laws that may pick winners and losers.

Upon assuming the Chairmanship of the Environment Committee I pledged to focus on well grounded science as a benchmark for regulations. In applying that standard here, I am concerned with considering the best approach given the potential benefits versus the costs.

To my knowledge, EPA is unaware of a single instance where toxins from electronics have leeched from a landfill. I am not suggesting that people must be injured before Congress or the Agency should act, however, I firmly believe that regulations should not be imposed for the sake of imposing regulations based upon the precautionary principle.

Further, Americans enjoy their electronics and domestic businesses have prospered as a result. However, dictating technology or increasing the costs of popular consumer goods based on circumstances still being studied may have a stifling effect on the highly competitive and global electronics sector.

This is the first hearing the Environment and Public Works Committee has ever held on electronics waste and the first hearing for Subcommittee Chairman Thune. I am confident that he will review and balance all of the points of view in considering this very complex issue. I look forward to working with him.

Senator THUNE. We thank the chairman for joining us and the best of luck with the Highway bill, something in which we are all very interested.

Senator BOXER. Thank you.

Senator Inhofe, get it done. I know you will get it done. If anyone can do this, you can.

Senator INHOFE. Thank you.

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. Each day more than 3,000 tons of electronic products are discarded. Every year, 50 million computers become obsolete. This waste from electronic products makes up an ever-increasing share of our Nation's total amount of solid waste. Even though it is going to be complicated, Mr. Chairman, I think you have struck a nerve because this is an important issue for us to get a handle on.

This electronic waste is not like normal food scraps that every American throws out. Waste from electronic products can be very toxic. Let me use TVs as an example. There are an estimated 287 million analog TVs in our Country. Each TV like each computer

monitor contains an average of 4 pounds of lead. If you do the math, you are talking about a lot of lead.

We are quickly moving into the digital age and many people in the very near future will switch to digital TV sets. I serve on the Commerce Committee where we are looking at that issue, the move to digital and how to make it go faster. Over time, if 90 percent of the analog TVs are thrown out, our landfills could be burdened with more than 1 billion pounds of lead, just from TVs.

Lead is not the only hazardous substance from electronic products. Electronic waste also contains heavy metals which my colleague has talked about, cadmium, arsenic and mercury. Unless disposed of properly, these substances can damage almost every system in the human body. We know about these products and we know about these heavy metals.

Municipal landfills are meant to hold trash, not extremely toxic material. Hazardous substances from crushed glass and other electronic debris can leak from landfills and threaten the nearby groundwater. The toxic substances in electronic wastes are known or suspected of causing cancer and birth defects. We know that lead can lower the IQs of children and damage their hearing. The toxic waste in these products can also damage the lungs, the liver, the kidneys and injure the human endocrine, cardiac, skeletal and nervous systems.

As my colleague from South Dakota, the chairman of this subcommittee pointed out, California has been one of the leading States in dealing with the problem, perhaps because we have a high concern for environment and also because we have such a large tech industry and frankly, a tech industry that has really been aware and sensitive to these problems.

Whatever the reason, California encourages recycling of e-products. The State has established a fee-based system that promotes the collection and recycling of cathode ray tubes. The State has also banned the disposal of cathode ray tubes in municipal landfills recognizing that many facilities may not be able to protect human health from toxins that can leach from such landfills. California has also established a program that requires retailers to take back cell phones for recycling.

I look forward to hearing from all of our witnesses starting with our esteemed colleagues and from people who are in California and other States trying to deal with this. Unfortunately, throughout most of the Country, the steps that California has taken have not been taken and much of this dangerous waste ends up in municipal landfills or is even shipped overseas for someone else to deal with our problems.

I think it is really important. This is a silent problem and we can't let these wastes silently seep into our drinking water supplies and then suddenly note an outbreak of some horrible problem with our children who as you know I always say are our most vulnerable, pregnant women, infants and children. That is kind of the place where we see it first. We cannot wait that long, Mr. Chairman. So my deepest thanks go to you for this hearing and I hope we can meet these challenges in a bipartisan way.

Thank you.

[The prepared statement of Senator Boxer follows:]

STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Good afternoon Mr. Chairman.

I would like to thank you for holding a subcommittee hearing on such an important topic.

Each day, more than 3,000 tons of electronic products are discarded. Every year, 50 million computers become obsolete. This waste from electronic products makes up an ever-increasing share of our Nation's total amount of solid waste. But, this electronic waste is not like the normal food scraps that every American throws out. Waste from electronic products can be very toxic.

Let me use TVs as an example. There are an estimated 287 million analog TVs in our country. Each TV, like each computer monitor, contains an average of four pounds of lead. We are quickly moving into the digital age in TV. And, many people in the very near future will switch to digital TV sets. Over time, if 90 percent of the analog TVs are thrown out, our landfills could be burdened with more than 1 billion pounds of lead, just from TVs.

Lead is not the only hazardous substance from electronic products. Electronic waste also contains heavy metals such as cadmium, arsenic, and mercury.

Unless disposed of properly, these substances can damage almost every system in the human body.

Municipal landfills are meant to hold trash, not extremely toxic material. Hazardous substances from crushed glass and other electronic debris can leak from landfills and threaten nearby groundwater.

The toxic substances in electronic waste are known or suspected of causing cancer and birth defects. We know that lead can lower the IQs of children and damage their hearing. The toxic waste in these products can also damage the lungs, liver, and kidneys and injure the human endocrine, cardiac, skeletal, and nervous systems.

California has been one of the leading States in dealing with the problem—perhaps because we have such a high concern for our environment, perhaps because we have such a large tech industry, or perhaps both. Whatever the reason, California encourages recycling of electronic products.

The state has established a fee-based system that promotes the collection and recycling of cathode ray tubes. The state has also banned the disposal of cathode ray tubes in municipal landfills, recognizing that many facilities may not be able to protect human health from toxins that can leach from such landfills.

California has also established a program that requires retailers to take back cell phones for recycling.

I look forward to hearing from one of our witnesses today, Ms. Sheila Davis, Executive Director of the Silicon Valley Toxics Coalition, and other witnesses about the recycling program in California and other States.

Unfortunately, throughout most of the country, these steps have not been taken and much of this dangerous waste ends up in municipal landfills or is shipped overseas.

We must not ship our problems to other countries or allow them to silently seep into our drinking water supplies. We must meet the challenge before us.

Senator THUNE. Thank you, Senator Boxer.

We have been joined by the Ranking Member of the full committee, Senator Jeffords from Vermont. Would you like to make an opening statement, Senator Jeffords?

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. Yes, I would.

Thank you, Mr. Chairman, for holding this general oversight hearing for electronic waste.

Computers, televisions and other electronic products have enriched our lives in a multitude of ways. They have also created a new problem, how to appropriately manage these products once they reach the end of their useful life. The sheer volume of electronic waste is staggering. Each year an estimated 220 tons of com-

puters and other electronic wastes are dumped in landfills or incinerated in the United States.

It is estimated that almost 50 million computers and monitors and approximately 20 million televisions became obsolete in the year 2003. The challenge of properly managing this much scrap is compounded by the presence of harmful toxins. EPA confirms that electronic scrap often qualifies as "hazardous waste" because it fails the Agency's toxicity test.

Each computer and the monitor contain an average of 4 to 8 pounds of lead, making computer monitors and televisions the greatest source of lead in municipal waste. The greatest source of mercury in these landfills is from batteries, switches and printed wiring boards. Likewise, the leading source of cadmium is the rechargeable nickel-cadmium battery found in the top computers.

From a resource conservation perspective, it is far better to reuse and recycle these materials rather than discarding them. For instance, the U.S. Geological Survey reports that 1 metric ton of computer scrap contains more gold than 17 tons of ore and much lower levels of harmful elements common to ores such as arsenic, mercury and sulfur.

However, in 2003, only 10 percent of consumer electronics were recycled in the United States. The remaining 90 percent were stored, disposed of in landfills or incinerators or exported for use and recycling.

In the absence of a national solution, a patchwork of differing State requirements is emerging. Four States have banned landfill disposal by cathode ray tubes and three States have passed electronic waste legislation; 26 other States reportedly are considering electronic waste legislation.

Some retailers and manufacturers have created voluntarily recycling programs to deal with the problem. This patchwork of State regulation and limited industry involvement is not sufficient to address the expected growth in electronic waste. There is also concern that it could place unnecessary costs on U.S. manufacturers if forced to comply with these inconsistent State regulations.

For these reasons, a national program is needed to provide incentives for the greater collection and proper recycling of electronic waste. The key question is how to finance the development of the infrastructure needed to address this looming problem. A variety of options have been proposed ranging from an advanced recovery fee on the sale of new equipment to a requirement that manufacturers take back their own equipment.

Senators Wyden and Talent have suggested an innovative alternative approach that uses tax incentives to encourage greater recycling. I was pleased to work with Senator Wyden in a similar recycling tax incentive in the Senator Energy bill. That provision would create a 15 percent tax credit for the purpose of equipment used to process or sort recycled materials including electronic waste. While modest, this provision is a first step toward building an electronic waste recycling infrastructure.

I look forward to hearing the expert testimony today from the EPA, industry and other interested stakeholders and their views on how to develop, fund and administer a national electronic waste recycling program. I hope to be able to work with you and other

members of the subcommittee on bipartisan legislation that would help build the infrastructure to mitigate the environmental impacts from electronic waste disposal and to maximize the resource recovery to be gained by greater electronic waste recycling.

Thank you.

[The prepared statement of Senator Jeffords follows:]

STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Mr. Chairman, thank you for holding this general oversight hearing on electronic waste.

Computers, televisions and other electronic products have enriched our lives in a multitude of ways. They have also created a new problem: how to properly manage these products once they reach the end of their useful life.

The sheer volume of electronic waste is staggering. Each year, an estimated 220 tons of computers and other electronic waste are dumped in landfills or incinerated in the United States. It is estimated that almost 50 million computers and monitors and approximately 20 million televisions became obsolete in 2003.

The challenge of properly managing this much scrap is compounded by the presence of harmful toxins. EPA confirms that electronic scrap often qualifies as "hazardous waste" because it fails the Agency's toxicity test. Each computer and monitor contains an average of 4 to 8 pounds of lead, making computer monitors and televisions the greatest source of lead in municipal landfills. The greatest source of mercury in these landfills is from batteries, switches, and printed wiring boards. Likewise, the leading source of cadmium is from rechargeable nickel-cadmium batteries found in laptop computers.

From a resource conservation perspective, it is far better to reuse and recycle these materials rather than discard them. For instance, the U.S. Geological Survey reports that 1 metric ton of computer scrap contains more gold than 17 tons of ore and much lower levels of harmful elements common to ores, such as arsenic, mercury, and sulfur. However, in 2003, only 10 percent of consumer electronics were recycled in the United States. The remaining 90 percent were stored, disposed of in landfills or incinerators, or exported for reuse or recycling.

In the absence of a national solution, a patchwork of differing State requirements is emerging. Four States have banned landfill disposal of cathode ray tubes and three States have passed electronic waste legislation. Twenty six other States reportedly are considering electronic waste legislation. Some retailers and manufacturers have created voluntary recycling programs to deal with this problem. This patchwork of State regulation and limited industry involvement is not sufficient to address the expected growth in electronic waste. I'm also concerned that it could place unnecessary costs on U.S. manufacturers if forced to comply with inconsistent State regulations.

For these reasons, a national program is needed to provide incentives for the greater collection and proper recycling of electronic waste. The key question is how to finance the development of the infrastructure needed to address this looming problem. A variety of options have been proposed, ranging from an advance recovery fee on the sale of new equipment to a requirement that manufacturers take back their own equipment. Senators Wyden and Talent have suggested an innovative alternative approach that uses tax incentives to encourage greater recycling.

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I look forward to hearing the expert testimony today from EPA, industry and other interested stakeholders on their views on how to develop, fund, and administer a national electronic waste recycling program. I hope to be able to work with you and other members of this subcommittee on bipartisan legislation that would help build the infrastructure to mitigate the environmental impacts from electronic waste disposal and to maximize the resource recovery to be gained by greater electronic waste recycling.

Senator THUNE. I thank the Senator from Vermont.

I want to recognize our panel of distinguished colleagues. When Senators Wyden and Talent first approached me about doing a

hearing on e-waste, I had to figure out exactly what it was they were referring to. I had heard of e-mail and e-commerce and I guess it makes sense that we have e-waste. It is an issue that I think more and more people in this Country can now identify with. There are a lot of us that it becomes very personal when you have a computer that is outdated and can't figure out what to do with it. Frankly, there is a patchwork of different State initiatives out there.

I had the conversation with some of our colleagues on the House side who had a hearing on this recently and said, we have a lot discussed about the problem, but we didn't have much come out in the form of solutions. I am hopeful that on the Senate side, you will have something more in the form of solutions.

Senators Wyden and Talent have introduced legislation that is a tax credit proposal. I want to give them great credit for taking the initiative to come up with something that attempts to provide incentives for people to figure out how to use and recycle many of these products.

We will hear as well from our colleague from the House side, Mike Thompson as well, but I want to start first with our Senate colleagues. Senator Wyden, Senator Talent informs me that you are the real guy spearheading this so you get to go first. We would love to hear from you.

STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM THE STATE OF OREGON

Senator WYDEN. We are a bipartisan team and I will just tell you that we are supposed to be discouraging gratuitous filibusters around here, so if I could just have my statement put in the record, let me perhaps make a few comments. Then I will turn it over to our friend, Jim Talent.

This really is a day of firsts and congratulations to you on your first hearing. This is the first time we have ever had a hearing on electronic trash, No. 1. Second, we have never had a bipartisan bill before and third, this is really a first in terms of a different approach. Senator Boxer is dead right, our States have done a variety of work in this area and have tried to be innovative.

It has always involved one of two things, either up front fees which I think will hurt consumers and make it hard to get them interested or slapping manufacturers with more taxes. Senator Talent and I have said that there really is an interest in jump starting a national approach. We use a tax credit approach, $8 per unit tax credit for companies that recycle significant numbers of display screens, a $15 tax credit for consumers.

The first question is how do you do something like this when you have a big deficit. We have said that we would envision doing something like this for about 3 years to try to jump start a national policy in this area. It seems to me that if we don't, what we are going to do is see States and localities put in place a crazy quilt of laws and regulations which we will eventually have to try to sort out.

Senator Jeffords and I have talked about it for years. We did get a baby step in the right direction in terms of the tax credit for e-

waste recycling equipment in the Senate bill and we are optimistic that will be signed by the President.

Senator Talent and I do think what is important now is that there is a national interest in terms of recycling electronic trash and not just sort of sitting around and waiting for this kind of hazardous stew of toxic e-waste to accumulate in landfills across the Country.

The last point that I would make, and Senator Boxer touched on this as well, is with respect to digital television, that on a bipartisan basis in the Senate we have finally begun to look at ways to ensure that we are always advancing the next set of technology. In effect, what you use one year is going to be obsolete the next and people will, in effect, be looking at that new round of products. So this problem is only going to grow exponentially.

I was really struck by the story a few days ago in the New York Times that talked about computers being so infected with spyware and adware that they are on life support and rather than try to debug computers, people essentially chuck them. Nobody really talked about spyware and adware very long ago. Senator Boxer, myself, Senator Burns and others have been working on this but the fact of the matter is that was a problem nobody envisioned just a few years ago and now all of a sudden the New York Times is running front page stories on why people are chucking their computers because they can't debug their system and will just say what the heck, let us get the next one.

We are very hopeful that on a bipartisan basis we can work to put less e-waste in the landfills and more in the recycling bin. We acknowledge the good work that is being done by States and localities around the Country but it is the view of Senator Talent and myself that if we don't get a national policy in place, particularly to jump start the effort to come up with a uniform set of incentives, 4 or 5 years down the road, we are essentially going to be trying to wade through another kind of morass. In that case, it will be a hodgepodge of inconsistent rules and regulations and our work will be that much more difficult.

We thank you for the chance to come and work with you and Senator Boxer and Senator Jeffords on this.

Senator THUNE. Thank you, Senator Wyden, for your testimony and for your thoughtful approach and looking beyond just identifying and defining the problem but actually coming up with something tangible, specific proposal that would help address it.

We will yield to your colleague, Senator Talent.

STATEMENT OF HON. JAMES TALENT, U.S. SENATOR FROM THE STATE OF MISSOURI

Senator TALENT. When Senator Wyden approached me about this, I really thought he had a good idea. I am happy to be his wing man on this idea.

I don't want to talk a long time about the problem because I think we all understand that. I do think it is important to keep in mind that if we don't do something we are really going to be overwhelmed by this. Everyone just needs to think of their own buying habits and their family's buying habits and think of the number of old computers and TVs that we are accumulating. We are going to

start running out of rooms in our attics, garages and basements and have to get rid of them.

I think the advantage of this approach is that it will provide a boost through the Tax Code for creation across the Country of a recycling system that will be uniform in the sense that this is a national incentive, it may adapt a little bit from place to place and we can get this into place. Consumers can get used to dealing with it, can see the benefits they get from it. Once that is in place, it will be easier for us to move to a different system of financing it if we want to do that.

The problem with collecting up-front fees is the hassle with it, the resentment people have and they don't know really what they are getting for the money they are paying. They are going to pay it whether you hit them directly or hit the manufacturer, it will get passed through to them. This way we get a system going and people can see it is working and get satisfied with it. Then we can figure out longer term how you want to finance it.

I really like this idea, although obviously the subcommittee and the committee are going to have to work on this and massage this a lot because we have introduced this as kind of a starting point but we understand there is a ways to go with it.

Senator THUNE. Senator Talent.

We are also joined this afternoon by Congressman Mike Thompson from the State of California, a colleague from the House side who is also keenly interested in this issue. Congressman Thompson, we would love to hear from you.

STATEMENT OF HON. MIKE THOMPSON, REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. THOMPSON. Thank you.

Congratulations on your first subcommittee hearing. I am glad to be a part of it.

I would like to go a step further than my two friends and Senate colleagues. I would like to suggest we make this a bicameral as well as a bipartisan solution.

I first introduced legislation 3 or 4 years ago on this issue trying to raise the profile because as everyone has recognized, it is a very serious problem. I will admit that my solution, my bill has the up-front fee, a point of sale fee. The idea was to get some startup money and let EPA take that money and spend it in the form of grants to anyone, public or private sector, who came up with a good program to deal with this problem.

For the record, please know that I am not married to that solution. I just think it is important that first, everybody recognizes the problem and then we all sit down and figure out the solution.

There are proponents for both the point of sale fee, there are proponents for the tax approach. There is also a new suggestion that we combine them and start with a point of sale collection so we can get the program started and then move to a tax type of solution to get it going and then as I think Senator Wyden said, phase it out altogether once it got up and going, but it is a problem.

You mentioned the landfill problem, the public safety problem with the heavy metals going into the environment and some folks are taking these components overseas and disassembling them

with child labor and discarding the bad stuff into the environment somewhere else but exposing kids to the problem. You mentioned the storage problem and said you have been confronted with this. Everybody is confronted with this.

The life expectancy of a computer today is so short that we out use their abilities and stick them in a closet someplace. I have had business people tell me that they actually have warehouse space in their businesses designated for storage for these computers because they have no place to put them.

The issue of States, I think Senator Jeffords mentioned there are three States, Maryland, Maine and California that already have programs. There are 26 other States currently considering legislation to put a program on the books. This could create such a mess not only for consumers but for manufacturers and for retailers as well.

All of this is just a bit more pressure that I believe should bring us to figure out the solution. In the House, we started a bipartisan working group with four of us who have taken this on as a major priority. Of the four of us, I think there are two or three who have bills but we would very much like to extend it, as I mentioned, make it a bicameral issue and figure out what that solution will be because hopefully we can move away from the issue of e-waste which suggests that this is waste we dispose of and move it toward e-scrap which may suggest that we can reuse or recycle these, or at least dispose of them in a proper manner.

I commend you for having this hearing and hopefully we can all come together and figure out what the solution is. Anyone who is at all honest will admit there is a problem. As mentioned before, the difficulty is finding that solution. I hope I am able to be a part of figuring that out.

Thank you, Mr. Chairman. I have a statement I will submit.

Senator THUNE. Without objection, we will have that placed in the record and again, thank you for your leadership on the House side on this issue. Frankly, I guess I am somewhat surprised it hasn't been dealt with sooner. There are stockpiles of computers, televisions and all kinds of electronic devices out there I am sure piling up in peoples' homes, garages and other places. So it is very timely and important that we get into this issue today.

We don't want to keep you all very long, but a question for Senators Talent and Wyden. On your legislation, why is it that you give the tax credit to "certified" recyclers?

Senator WYDEN. I think whenever you are trying to use scarce resources, particularly in the Tax Code I saw what a battle it was just to get the incentive for the purchase of equipment, you have to draw the line somewhere. We thought that made the most sense in terms of scarce dollars.

Senator Talent and I were saying, there would be a variety of ways to complement our bill. Say you wanted to have diminimus up front kind of charge so people had some skin in the game in terms of recycling, something like that could be looked at. We essentially made the definition because we thought that was the best use of scarce dollars.

Senator TALENT. There have been a lot of incidents of illegal dumps and recycling centers around the Country, basically fraudu-

lent outfits that advertise themselves as recycling centers and take the computers, get some money from people and dump it. We had an incident of that in Missouri. So the idea here is to have some kind of a process where you can certify that the recycling center is up to standards before they are eligible for the tax credit. That is the most obvious way of doing it.

Senator THUNE. Senator Boxer?

Senator BOXER. I would commend you on that. It is really key because otherwise we will have these little businesses spring up which, as you say, are just a front to collect some money and don't do the job. So thank you for that.

Senator Wyden, since you, according to Jim Talent, came up with this idea of the tax credit first, do we know because we have these deficits, what the cost will be here because we are going to lose money from the Treasury, so what does this add to the deficit?

Senator WYDEN. We think it might be $300 million to $400 million. We obviously have to kind of crunch the numbers in terms of how much recycling would be done. There will obviously be definitions and the like, but it strikes me, and this is the heart of what we are trying to do, we are not saying put a tax credit in place in perpetuity. We are saying look at it for a relatively short period of time and we think if you even capped it somewhere in the vicinity of $300-$400 million, you could with a sharp pencil say that would be a good investment.

Senator BOXER. I want to ask the whole panel a question. I sometimes think we under estimate the people out there. People hate taxes, let us face it, but if they know there is a dedicated tax, a dedicated fee, they feel very differently about it, at least the calls that I read. So if it was $2 a product and plus you did a tax credit in combination, are you willing to look at that with us because I fear if it is $300 million to $400 million a year, you are talking real bucks over time. We just don't have it, so I am just wondering if you would be willing to work with us.

As Mike Thompson said, and he is a very pragmatic legislator, maybe there is a way we could do some combination thing where the consumers pay but not to a point where they are upset about it. For example, the airport fee, a lot of people were scared after 9/11, how can we ask people to pay a security fee? Let me just tell you, people in California who travel across the Country all the time are happy to do it if they know it is going for security.

If this was drawn in such a way, would you be open to working with us? I even know if Senator Thune is interested in this. I am just saying for myself, I think the more avenues we have to explore so we don't come to our colleagues with a big hole in the deficit.

Senator TALENT. If I was in your position, the position of the Ranking Member, I wouldn't rule out anything. My own sense of it is that you are right, that if people have an assurance they know what the money is going for and have assurance it is taking care of a real problem, they would be more open to that. The question is how do you give them that assurance, how do you get a system up and running first.

You are also right, I think, in believing people may be ahead of us on this issue because everybody has to deal with this. Every time you walk by one of the old computers in your garage or some-

thing, you say to yourself, what am I going to do with that, it is just taking up space.

I think this is a basis for discussion and we would like to continue being a part of it. I was saying to Senator Wyden I see the stirrings of an E-Waste Caucus here beginning on a bicameral basis.

Senator BOXER. Yes.

Senator WYDEN. I think that is a very good point. It was just our concern that if you are trying to build this ethic to recycle these electronic products rather than chuck them, you just want to make sure that the first thing people don't see is a huge batch of new taxes. I think if it is an effort where the Federal Government is going to be a partner in trying to set up the national infrastructure and say to people, we want you to have some skin in the game too, there will be some charges, I think something like that ought to be on the table.

Senator BOXER. Thanks.

Senator THUNE. Senator Jeffords?

Senator JEFFORDS. What about some way that we could get money put into whatever we were using and then a refund to get people to buy it back?

Senator WYDEN. Probably too logical for government. I think all those kinds of things ought to be on the table as well. Jim touched on this at the outset. You have to figure out a way as people begin to get acclimated to these kinds of priorities and say look at all this stuff we are going to have, you have to make sure that it is user friendly and there isn't a lot of confusion about how it is set up. I think that is attractive too.

Senator TALENT. The only concern I would have and I am sure your other panels will have a lot of comments on these various alternatives, we ought to try and set it up so the system is as simple as possible so the incentive is consumer buys and consumer takes to the recycling center rather than takes back to a store and they then take to a recycling center. I wouldn't rule out anything at this stage.

It is music to my ears to hear there is resolution on the part of the leaders of the committee to address the problem. I think this hearing is a good first start. I hope you take these ideas and put them all together in a bill. The longer we take to do something, I think we are all in agreement, the harder it is going to be when we finally do something.

Senator JEFFORDS. Thank you.

Senator THUNE. One final question. You ended up at $15 on your individual and $8 for a small business. How did you come up with the number?

Senator WYDEN. You can see, Chairman Thune, the list of people that endorsed the legislation. We essentially pulled together this environmental and industry coalition. For example, the $8 credit should go to companies that recycle at least a significant number of screens, again because you are trying to draw the line. Certified recyclers are going to be the priority in terms of focal point for entering the system.

The credit for the companies was built on the idea there should be a significant number of display screens or computer systems

that a company used per year but this was a judgment essentially that we came to by talking to that support group, the coalition of consumers and business leaders. If we are lucky to go that kind of route, we ought to be consulting with them more to try to refine what is that target point that will make it attractive for people to do this and incorporate some of the ideas that we touched on here about whether individuals ought to have to pay something.

Senator THUNE. Very good. Thank you all very much.

We have heard from our first panel on some proposals. Thank you Senators, thank you, Congressman Thompson. We will call our second panel. We will have an opportunity to hear from EPA and others if there is a problem out there that needs to be addressed. We look forward to hearing their testimony.

I want to welcome our second panel. As part of that panel, we have Thomas Dunne, Acting Assistant Administrator, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency; John Stephenson, Director, Natural Resources and Environment, U.S. Government and Accountability Office; and Garth Hickle, principal planner, Minnesota Office of Environmental Assistance, one of the four States that I think has taken steps or put in place some sort of comprehensive approach to dealing with the issue of electronic waste.

We will start on my left with Administrator Dunne.

Before we begin, let me say we are going to adhere to the 5-minute rule. So if you will confine your oral remarks to 5 minutes and any additional information you want to present, we will make sure it gets put into the record.

STATEMENT OF THOMAS P. DUNNE, ACTING ASSISTANT ADMINISTRATOR, OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. DUNNE. Good afternoon.

As you said, my name is Tom Dunne, and I am the Acting Assistant Administrator for EPA's Office of Solid Waste and Emergency Response. I am pleased to appear today to discuss how EPA is addressing electronic issues including management, reuse and recycling. I will summarize my testimony but ask the written statement be submitted for the record.

Senator THUNE. Without objection.

Mr. DUNNE. EPA believes that more emphasis needs to be placed on conservation and recovery in the Resource Conservation and Recovery Act known as RCRA. To that end, EPA launched a Resource Conservation Challenge in the year 2002. Arguably, the best way to manage waste is to eliminate it by designing products and processes that minimize waste, by collecting waste products and reusing them and by using input materials more efficiently.

EPA has been involved with the improvement of electronics design and recovery for a number of years. This involvement was prompted by several EPA concerns including the increased growth of electronic wastes, the potential for exposure to substances of concern contained in some discarded electronics if they were not properly managed and the lack of a convenient, affordable, electronics reuse and recycling infrastructure.

Electronic waste is an increasing portion of the municipal solid waste stream, although it contributes less than 2 percent of municipal solid waste. EPA estimates that in 2003, approximately 10 percent of consumer electronics was dismantled and recycled domestically. The remaining 90 percent of discarded consumer electronics was stored, reused or refurbished, exported or disposed of in landfills or incinerators.

Discarded electronic products contain a number of substances that cause concern if improperly managed, including lead from cathode ray tubes and mercury in flat panel displays. While used electronic products do not pose a human health or environmental threat at this time, it makes good sense to reuse and recycle these products to bring about better materials management, create more jobs and economic activity and to promote greater resource conservation.

EPA is currently engaged in a series of partnerships with manufacturers, retailers, recyclers, State and local governments, nonprofit organizations and other Federal agencies to encourage the improved design of electronic products, help develop an infrastructure for the collection and reuse and recycling of discarded electronics and to encourage the environmentally safe recycling of used electronics.

For example, EPA funded and participated in a process with electronic manufacturers, government technology purchasers and other organizations to develop the electronic product environmental assessment tool called EPEAT. EPEAT will help large technology purchasers identify electronic products that are designed in a more environmentally friendly manner and it is expected that EPEAT will be operating in 2006 when manufacturers who meet their criteria will be able to certify their products.

The initial electronic products eligible for EPEAT certification will be desktop computers, laptops and monitors. In addition, EPA has entered into a voluntary partnership with a number of electronic manufacturers, retailers and State and local governments to develop the Plug-In To eCycling. The aim of this initiative is to raise the public awareness of electronics recycling and to increase recycling opportunities.

In the first 2 years of the initiative, more than 45 million pounds of unwanted electronic products were recycled by Plug-In partners. Further, EPA launched several pilot projects last year with manufacturers, retailers and local governments to provide consumer electronics recycling. The pilots resulted in more than 11 million pounds of reused electronics and were collected in retail stores including New England area Staples, Seattle area Good Guys and all of the Office Depot locations.

EPA has also partnered with the Federal Environmental Executive and several other Federal agencies to launch the Federal Electronics Challenge or FEC. The U.S. Federal Government is the largest bulk purchaser of electronics products in the world. In fiscal year 2005, the Federal Government will invest roughly $60 billion in information technology equipment and services. That represents about 7 percent of worldwide purchases. Therefore, it is fitting that the Federal Government lead by example.

The FEC is a voluntary partnership of Federal agencies that have committed to develop a more sustainable environmental stewardship of electronic products. Twelve Federal agencies have signed a Memorandum of Understanding on electronics management which will help increase reuse and recycling. These agencies represent roughly 83 percent of the Government's information technology purchasing power.

Finally, EPA continues to work with a wide range of stakeholders to further encourage the reuse and recycling of electronic products. Last spring, the agency hosted a national electronics meeting attended by representatives from industry, government and non-profit organizations to discuss electronics management issues.

As a result of these meetings, a collaborative strategy is being developed that included the development of a certification program for electronic recyclers, a development of a nationwide electronics recycling data repository and piloting a private, multi-state organization to help support electronics recycling in the Pacific Northwest.

Mr. Chairman, that concludes my summary of some of the efforts to encourage electronics management, reuse and recycling and certainly, I would be happy to answer any questions you or other subcommittee members may have.

Senator THUNE. Next is Mr. Stephenson from the Government and Accountability Office which has prepared an analysis of this subject at least in draft form. I was one of the requesters of that as was Senator Boxer. I understand you will be coming out with a final draft some time this fall. I appreciate the work you have put into it already in terms of finding out the state of play out there with respect to this issue and some of the things being proposed.

Mr. Stephenson.

STATEMENT OF JOHN B. STEPHENSON, DIRECTOR, NATURAL RESOURCES AND ENVIRONMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Mr. STEPHENSON. Thank you. It is a pleasure for us to be here to discuss our ongoing work for this subcommittee on the growing problem of used consumer electronics, primarily computers, monitors and televisions but in the future maybe other types of consumer electronics.

As you know, rapid advancements in technologies have led to increasing sales in electronics but with this increase comes the dilemma of how to manage products that have reached the end of their useful lives. Recycling and reuse have great potential to help deal with this dilemma but there are also significant challenges.

Today, I will summarize our work to date on one, existing information on the volumes of and problems associated with used electronics and two, factors affecting the Nation's ability to recycle and reuse these electronics.

To address these issues, we are currently surveying key stakeholders including manufacturers, retailers, trade associations, recyclers, environmentalists and State and local governments. To date, 41 of the 53 surveyed participants have responded. We are also vis-

iting States and localities that have implemented programs or passed legislation to manage used electronics.

Available estimates strongly suggest that the amount of used electronics is large and growing and that if improperly managed, can harm the environment and human health. Over 100 million computers, monitors and televisions become obsolete each year and most are probably being stored in places like basements, garages and warehouses. So the opportunity is to act now.

The question is what will happen to these units that can be recycled and reused but might also be disposed of in landfills or exported for recycle or reuse overseas. Standard regulatory tests show that some toxic substances with known adverse health effects have the potential to leach from discarded electronics into landfills.

As has been mentioned, the CRT tube can contain as much as 4 to 8 pounds of lead. Some suggest that because modern U.S. landfills are designed with liners and other safety precautions, leaching into the environment is not a major problem. However, about 70 percent of heavy metals in landfills currently come from discarded electronics and studies on the long term effects are limited.

In addition, many used electronics end up in countries without modern landfills or with considerably less protective environmental regulations. Moreover, if these electronics are simply discarded in landfills, valuable resources such as copper, gold and aluminum are lost for future use.

For a perspective, the U.S. Geological Survey has reported that one metric ton of computer circuit boards contains between 40 and 800 times the concentration of gold contained in gold ore and 30 to 40 times the concentration of copper while containing much lower levels of harmful elements common to such ores. Despite the clear advantages, less than 10 percent of electronic waste is currently being recycled.

So, what is the problem? The cost along with limited regulatory requirements or incentives discourage recycling and reuse. Consumers generally have to pay fees ranging from $10-$27 per unit and drop off their used electronics at often inconvenient locations to have their used electronics recycled or refurbished for reuse. Such economic factors are compounded by Federal regulatory requirements that provide little incentive for environmentally preferable management of used electronics.

EPA regulates hazardous waste under the Resource Conservation and Recovery Act but lacks the authority to require environmentally preferable management of used electronics through recycling and reuse or to establish a mandatory national approach such as a disposal ban or financing schemes. As a result, all of its efforts are voluntary.

In the absence of a national framework for dealing with this problem, a patchwork of potentially conflicting State requirements, albeit good in their own right, create some problems. Manufacturers in one State, for instance, may have an advance recovery fee placed on their products but the same manufacturers may have to take back their products and pay for recycling in another.

This patchwork may be placing a substantial burden on manufacturers, retailers, recyclers and stakeholders. It is worth noting

that several European countries have established disposal bans and they have been in place for some time and that the EU has a financing plan proposal.

In light of all this activity, it is not surprising that 97 percent of our survey respondents to date have told us that some type of national legislation is needed to deal with this growing problem. As we conclude our work, we will be further examining ongoing efforts among the States to deal with this growing problem, the various legislative solutions that have been proposed to create a uniform national approach, and options the Federal Government can pursue to encourage recycling and reuse of electronics.

Thank you. That concludes my statement.

Senator THUNE. Thank you.

Mr. Hickle is with the Minnesota Office of Environmental Assistance. We welcome you here today and look forward to your testimony.

STATEMENT OF GARTH HICKLE, PRINCIPAL PLANNER, MINNESOTA OFFICE OF ENVIRONMENTAL ASSISTANCE

Mr. HICKLE. My name is Garth Hickle with the Office of Environmental Assistance, a division of the Minnesota Pollution Control Agency. Thank you for the opportunity to provide testimony today and share Minnesota's experience for the management of waste electronics. Given the State, legislative and programmatic attention devoted to this issue over the past 5 years, congressional attention is an important step forward to address this complex issue.

The Office of Environmental Assistance began to address this issue in 1995 at the request of our State legislature in response to concerns regarding the growing presence of discarded electronic products in the waste stream and the potential environmental impacts of an electronics disposal. While there is debate regarding the actual long term environmental impacts from disposing of waste electronics in landfills, Minnesota has framed the issue as one of resource conservation and the promotion of economic development opportunities created by the collection and de-manufacturing of old electronic products.

The environmental benefits, energy savings and job creation from promoting waste as a resource have guided our thinking as to the rationale for the collection and recycling of waste electronics. It is Minnesota's intent to ensure that residents have convenient access to collection opportunities and that the infrastructure is sufficient to discourage illegal dumping, abandonment of collected products and the export of waste electronics to nations with less stringent environmental standards.

Since 1997, the OEA has facilitated a number of demonstration projects for the collection of waste electronics with participation from manufacturers, local government and recyclers. Partnerships with individual manufacturers and retailers such as Best Buy and Target, both Minnesota-based companies, have served to model various collection options and assess costs. The OEA has also participated in several efforts to bring parties together to implement comprehensive programs both at the State and national level.

We actively participated in the National Electronic Product Stewardship Initiative. While NEPSI did not arrive at a consensus re-

garding how a national program should be financed, the stakeholders did agree on the need for several important elements of a national program, including a broad scope of products beyond just televisions and monitors, the need for performance goals and funding for local collection activities, environmentally sound management standards and a third party organization to implement a program.

The Minnesota Legislature has also considered legislation for waste electronics each year since 2002. The proposals have ranged from advance recycling fees similar to the program enacted by SB–20 in California to the producer responsibility approach implemented in Maine. The different business models and perspectives within the industry that prevented a national approach from emerging from NEPSI have also stymied passage of a State program in Minnesota.

Following the 2004 Minnesota legislative session, the OEA initiated another consultation process with significant participation from stakeholders to identify expectations for a program in Minnesota. The expectations include offering convenient collection options for residents that address a broad scope of products and track the purchasing and disposal habits of consumers utilizing existing infrastructure and providing incentives for collection, ensuring accountability for collection and recycling by identified parties, promoting environmentally sound management and providing incentives for design for the environment.

As well, we identified support in private management to the extent possible to reduce government involvement in management of the program as a key principle. Last, financing the program without relying on end of life fees or local government funding. While developed for Minnesota, the expectations listed above will also be relevant for a comprehensive national program.

This subcommittee will certainly hear from manufacturers, retailers and others on the preference for a national approach for business reasons to avoid a patchwork of State programs. A Federal approach will also address some of the concerns faced by State government grappling with this issue. From the perspective of State government and consumers, a Federal approach may provide a consistent standard and eliminate regional disparities.

For instance, in 2003 Minnesota enacted a disposal ban for cathode ray tube containing products, televisions and computer monitors that is now slated for implementation in 2006. This ban raised a concern among neighboring States, South Dakota, North Dakota, Wisconsin and Iowa that televisions and monitors from Minnesota would be transported across Minnesota's border for disposal.

A Federal framework would also eliminate the impact upon border sales if, for instance, one State enacted a consumer fee-based program while a neighbor State did not. A national program might also greatly simplify administrative responsibilities such as compliance reporting and public education.

If comprehensive national legislation is contemplated, a step Minnesota supports, it is important to consider the following: adopting an approach that engages all the players along the product chain from manufacturers to local government to share respon-

sibility for funding and operating a program and such an approach would result in a more effective that provides incentives for more environmentally friendly products in the future but will not place significant additional burden on government.

Legislation should also contain a financing mechanism that recognizes the different business models within the electronics industry and provides flexibility to implement tailored collection activities. A framework should be established so that products can be added or deleted as the technology and consumer purchasing habits evolve and finally, adopting performance standards and mechanisms for evaluating progress.

If a comprehensive national program is not adopted, there are still several steps the Federal Government could undertake to support the collection and recycling of discarded electronic products including performing data collection and analysis, ensuring a consistent regulatory environment to support reuse and recycling of discarded products, developing clear standards for environmentally sound management that impose restrictions on the export of waste electronics to countries with less stringent environmental standards and finally, engaging in research and analysis regarding innovative partnerships to manage the program.

It is important to acknowledge that USEPA and others have projects underway to address some of these issues. USEPA in particular deserves significant recognition for the resources and staff that have been devoted to this issue over the past several years.

Thank you for the opportunity to be here today. I look forward to addressing any questions you may have.

Senator THUNE. Thank you, Mr. Hickle.

I will advise my colleagues who are here we will try and adhere to 5-minute rounds for us as well and the additional questions we have, we can submit for the record.

Mr. Dunne, I would like to direct a question to you. First, because Congress has exempted household waste such as TVs and computers from the Hazardous Waste Rules, are there any particular concerns that EPA has when it comes to handling this particular waste stream?

Mr. DUNNE. You have to be vigilant in terms of what you are doing. Even with the exemption, we have to be careful about sham recyclers creeping up. Senator Talent mentioned there was a case in Missouri and there were some other cases but there are always people who will go outside the realm.

We feel so far based on data that we have, which are not necessarily complete, even though a cathode ray tube may not meet the TCLP test, it doesn't necessarily create an environmental problem as long as the landfill is properly lined and has a leachate system in place; they would be able to catch it.

However, I think we have to continue to study this. We have a study done by the Solid Waste Association of North America that has not been able to trace any concerns so far. They represent municipal solid waste organizations in their cities. There has been some research and study which we sponsored at the University of Florida that so far suggests there is not contamination but I do think we don't have enough data in this Country to jump to the conclusion that it will never occur. Right now, I don't think there

is any data that we have seen and been able to analyze to say there is an environmental problem right now.

Senator THUNE. Are you aware, under existing landfill permitting regulations, of any instances in which toxins from electronics have led to human exposure?

Mr. DUNNE. I am not aware of any particular case. There could be but I am not aware. I want to remind you of something. We do have the subtitle (c) part of RCRA and there is a structure in place which this committee helped to pass in about 1976, I believe. It is run by the Federal Government and the States. We can always fall back, if there is a hazardous waste problem through corrective action under subtitle (c), so we couldn't have just a voluntary program without the basis of the regulatory program in place right now.

Senator THUNE. Mr. Stephenson, during the course of GAO's work, have you come across any estimates as America transitions to HDTV about how that might increase the number of televisions that could end up in landfills?

Mr. STEPHENSON. No, because converter boxes will likely be used to make old TVs HDTV compatible, we don't think that there will necessarily be a spike in the number of TVs that appear as waste. But, you have to remember that even the plasma screens that are replacing those old CRT tubes have mercury in them. So you have to consider all forms of electronic wastes.

The real problem is that without a landfill ban, people are not incentivized to do anything with their computers. The fact that most have done nothing with them sort of exemplifies that. It is easy to put an old computer on your curb but if you have a landfill ban, you can't do that. We think that should be an integral part of any legislation or national program that is considered. The States that have landfill bans have exponentially more recycling and reuse than those that don't.

Senator THUNE. Did I hear you say, Mr. Dunne, that if there was a determination made by EPA that these materials were hazardous that under subtitle (c), you would have the authority to enact regulations?

Mr. DUNNE. I said that if it is causing contamination in a particular landfill, we and the States who run most of the program, the operational side, could fall back on subtitle (c). It isn't whether there is lead in a material, we know there is and there is a significant amount of lead going into landfills. That is one of our concerns, the volume of this. That is why we are dealing with this as a separate issue rather than straight municipal landfills.

Senator THUNE. My time has about expired. I have a question I would like to address to Mr. Hickle, but I will yield now to the Senator from California.

Senator BOXER. Mr. Dunne, I thought you said this isn't so much of a problem on the cathode ray tubes, so I want to ask you a question. Do you agree with this, "Toxicity characteristics of cathode ray tubes above the toxicity characteristic regulatory level of 5 mg per liter that is used to classify lead containing waste is hazardous"?

Mr. DUNNE. I think so but when you ask it very specifically like that, I would have to go back and find out the exact answer.

Senator BOXER. What I read to you was EPA. That is what EPA says, that it is a problem.

Mr. DUNNE. I think what you have to do is quantify the problem. A tube by itself may have these characteristics, but whether or not it presents an environmental problem put into a qualified landfill doesn't represent a health or environmental problem as far as we know today.

Senator BOXER. I am confused because in 2002, and I ask unanimous consent to place this in the record, EPA makes the case that we do this rule.

[The referenced document not received at the time of print.]

Mr. DUNNE. The rule is under development right now, the cathode ray tube.

Senator BOXER. I know that. Do you know when it started to be considered? Do you know what year?

Mr. DUNNE. My guess is back in the 1990's.

Senator BOXER. It was 1998, that is 7 years. Picking up from your demeanor and your comments on this, I don't sense you are particularly interested in moving this through. Is there anything you can tell me in terms of the EPA's intention? Do you have an EPA decision on when you are going to finish this regulation and promulgate it?

Mr. DUNNE. It is going through review right now, Senator. I would assume in the next few months, there would be some determination in terms of what rule will be published.

Senator BOXER. In a few months, you will have a determination on?

Mr. DUNNE. On the cathode ray tube rule.

Senator BOXER. So in a few months, you won't have the final version of the rule but you will know if you are going to have a rule?

Mr. DUNNE. Yes and it could be published shortly.

Senator BOXER. What could be published?

Mr. DUNNE. The rule on cathode ray tubes.

Senator BOXER. Do you expect that to happen?

Mr. DUNNE. It is very possible.

Senator BOXER. Can you give me an approximate date?

Mr. DUNNE. I don't control the calendar in terms of when it goes to reviews.

Senator BOXER. Who does?

Mr. DUNNE. The interagency review process takes time and the Office of Management and Budget reviews it.

Senator BOXER. The value of leaded glass recently dipped to minus $200 per ton. This change reflects a shift in the consumer preference for different technologies. Doesn't this drop in value eliminate EPA's rationale for exempting cathode ray tubes from hazardous waste regulations as a "valuable commodity"?

Mr. DUNNE. I don't think so.

Senator BOXER. Do you still think it is valuable?

Mr. DUNNE. I think it is valuable in the sense that we want to be able to regulate only those things that create a real environmental threat. I don't think that we have to gauge every rule on today's market share.

Senator BOXER. But that wasn't the question. I understand what you are saying. You want to make sure that it is an environmental threat before you regulate it. I understand that. I appreciate that, but that is not the question. One of the reasons for the rationale for exempting cathode ray tubes in the past has been that it has been deemed a valuable commodity. Isn't that rationale gone now given what I told you about the value, putting aside the risks?

Mr. DUNNE. I don't think what I have seen so far of the evaluation done by staff is that there is some cost benefit analysis if it has to be done with every rule and it seems to me there is probably some benefit to exemption.

Senator BOXER. Because?

Mr. DUNNE. Because there is still value in the marketplace.

Senator BOXER. I told you it is minus $200.

Mr. DUNNE. It still may have value. I don't know.

Senator BOXER. I will follow up with some written questions. That makes no sense. I was an economics major, what do I know. I don't understand something having such great value when it doesn't have any value, has a minus value, but we will get into that later.

To finish my last question, then I might ask for a second round, we know that cathode ray tubes can leach four times the amount of lead as material that is regulated as a hazardous waste. I just read EPA's own words on that. The EPA's Inspector General recently noted that EPA is testing other types of electronic wastes for their hazardous characteristics. What types of electronic material has EPA tested for its hazardous characteristics and what were the results?

Mr. DUNNE. I will have to get you that for the record, Senator. I am sorry, I can't answer that right now.

Senator BOXER. In October 2003, EPA proposed a rule that could deregulate up to 3 billion pounds of hazardous waste including used circuit boards. Among other problems, EPA's proposed rule would allow hazardous waste to be shipped on public roads without any tracking documents. Can you please tell me the status of that proposed rulemaking?

Mr. DUNNE. I believe it is still under development and I don't have a timeframe in terms of when the regulation would come out but we can give you an approximation when we go back to the office.

Senator BOXER. I would like that answer in writing. We will propound our unanswered questions.

Thank you.

Senator THUNE. Senator Jeffords?

Senator JEFFORDS. I have heard from numerous industry groups concerned about the emerging patchwork of conflicting State and local rules governing electronic waste disposal. Do you agree that the Federal legislation is needed to build a national infrastructure to encourage electronic waste recycling or does EPA have the tools it needs to do the job?

Mr. DUNNE. I think it has been pointed out by GAO that we don't have mandatory authority or regulatory authority. We have been meeting with industry and other people as I mentioned in my testimony. I am not too sure what Federal standards or a program

would look like at this particular point. It was interesting to hear the two Senators and the Congressman who have two different approaches. That is fine and there may be many other approaches. It is a matter of which one do you test that is going to make some sense.

We haven't taken a position because I don't think we have enough knowledge and information but we do recognize the problem in terms of the collection of electronic material and also the marketplace condition of electronic material in terms of making it more efficient. It may well be in the future that as you consider this, you will have enough ideas and we will be able to aid you if it is going to be a Federal system.

Senator JEFFORDS. In my service of the Country in the Navy, I traveled around the world and I found when we went into Asian countries, they seemed to have a great facility for taking equipment and understanding them and modeling them and taking our secrets and improving on them. Do you find when you do travel that the European and Asian nations are somehow ahead of us, stealing information from us and getting better equipment?

Mr. DUNNE. I am not fortunate enough as a Government official to get to travel outside this Country, so I am not sure I am an expert on that. Certainly the European Union has advanced some laws and some regulations based on part of California's law. That is going to change some of the way our manufacturers who are international producers, not just for the United States, in terms of how they produce. Certainly there are lessons to be learned I suspect from watching what the European Union is doing.

Senator JEFFORDS. Mr. Stephenson, Mr. Hickle, any comments?

Mr. STEPHENSON. Some of the countries, Japan, the Netherlands, Switzerland, are leaders in the recycling of electronics. They have had programs in place since 1998, so I think they are a little bit ahead of us on this. The EU and certain countries in Europe have bans on landfills and the EU is proposing a financing option that largely puts a lot of the onus on the producer of the consumer electronics to be responsible for end-of-life disposal.

We think, as the Senators said before, all options ought to be on the table at this point. Our stakeholders seem to think that some sort of a hybrid option possibly with an up-front fee combined with manufacturer responsibilities might be the way to go. Each approach one has pros and cons and that is part of what we will be evaluating as we complete our study for the subcommittee.

I agree with Senator Boxer that in general, if people know what the fee is going to be used for, $6-$10 is not a lot to pay at the point of sale to build a fund to handle recycling and reuse later.

Senator JEFFORDS. Mr. Hickle?

Mr. HICKLE. Senator Jeffords, in addition to the developments in the European Union, I think it is also important to look at the step forward that Canada has taken. Alberta currently has a program in place right now for e-waste and there are proposals on the table in Ontario, Nova Scotia, Sasketchwan and I believe British Columbia as well. I think largely in Europe, many of the countries in Asia and now in Canada, they have been able to address this problem in a fairly comprehensive fashion.

Senator JEFFORDS. Thank you.

Senator THUNE. Thank you, Senator Jeffords.

We will indulge the members and ask a few more questions. I have a couple here and I think Senator Boxer does as well.

Mr. Hickle, as a Senator from a State that borders Minnesota, I appreciate hearing how your State has worked to address this issue. Because you prohibit CRT tubes from being disposed in landfills, I thought your perspective would be helpful to the committee as we learn more about the challenges the individual States are facing.

Since it seems funding is the greatest challenge for implementation of your e-recycling program, where do you see your legislature heading on that? You mentioned in your testimony some things that they have been reviewing and looked at in the past. Are they coming to any consensus on that?

Mr. HICKLE. Senator Thune, we have been deadlocked on this issue for 4 years. As I mentioned, the competing industry visions of how any waste system should be financed has been very much in play in Minnesota, so there has not been resolution to this point. I am hoping that in the upcoming legislative session, the legislators will be able to look at what I think Mr. Stephenson referenced as a hybrid option that potentially combines some sort of fee-based and producer responsibility program as one package. There is a legislative task force that is being convened to address this issue in the interim, so I am really excited we will be able to see a break through on this next year.

Senator THUNE. Senator Boxer?

Senator BOXER. Mr. Dunne, have you seen the EPA Inspector General report dated September 1, 2004?

Mr. DUNNE. I don't think I have read it.

Senator BOXER. It is titled, "Multiple Actions Taken to Address Electronic Waste but EPA Needs to Provide Clear National Direction." I would ask unanimous consent that we just put the summary in the record today, Mr. Chairman.

Senator THUNE. Without objection.

[The referenced document not received at the time of print.]

Senator BOXER. It is just very clear what your own Inspector General is telling you. I guess if you haven't read it, you wouldn't know, but one of the things is finalize the CRT rule as soon as possible and hopefully you are doing that; define your e-waste program, your goals, your performance measures, communicate them to stakeholders, just about five of these. I would like to get this to you.

EPA's Plug-In To eCycling Program is a voluntary partnership to increase electronics recycling. The IG reported that several stakeholders involved with recycling electronics didn't understand the purpose of the program or weren't even aware of it. What steps is EPA taking to clearly define the program's goals and to increase awareness of the program?

Mr. DUNNE. Senator, we are in the stage where we are completing a strategy in terms of municipal solid waste and some others including electronics. I was out in Las Vegas to the Consumer Electronics Products Show and there were other governmental officials there and I believe there are 21 partners involved in that who have been involved in recycling, some jointly, some on their own

and we want to give recognition and encouragement to some others.

I haven't read that report thoroughly enough I guess to understand, if I understood what you said, how somebody could participate in the program and not know what it is about. If that is what it said, it seems very strange. Maybe they interviewed the wrong person in the company. I am not too sure, so I would have to take a look at the analysis done on that because I really don't know.

Senator BOXER. I would think if the Inspector General is doing a good job he wouldn't just talk to one person. I think they would go out and interview a number of companies to see whether or not they heard of this program. I guess my feedback to you is this is a year old or so.

I hope you would look into it because that seems to be a sad situation when you are doing a program to help people understand they should recycle and they say, we don't even know about the program. It just sounds like you are doing it but you are not really putting any effort behind it maybe or the Inspector General maybe did a terrible job on this report which you indicated maybe he talked to the wrong person. Just accept the fact that the IG has made this very important evaluation.

I think you should take it as a criticism you should take in a good way and say maybe we are not doing enough, let me get back to you, Senator, let me see, because I think rather than be defensive and say, they only asked one person, maybe the truth is there is a good program out there in the EPA but you are not doing enough to publicize it. That would be my reaction.

Mr. DUNNE. I am not going to question the competency of the Inspector General's Office on this. I mentioned in my testimony that we had an electronics conference not too many months ago and 200 people showed up. A number of them came from this particular program.

I find it difficult that any company or city would lend their name to something and say they don't know about it, so I would have to go back and analyze what the Inspector General really did to come up with that conclusion. I just haven't seen it.

Senator BOXER. OK. Let me ask you one more thing. The EPA Inspector General recently concluded that the United States is "lagging behind international e-waste efforts," which you alluded to when you talked about some of the things Europe is doing. The IG highlighted international laws that require manufacturers to take financial responsibility for recycling consumer electronic products and to reduce the use of six toxic chemicals in these products.

Here is what I think is interesting. Maybe you are prepared and maybe you want to get back to me but here in the United States, we have the Pollution Prevention Act. It establishes a national policy that "pollution should be prevented or reduced at the source whenever feasible." I guess my question is, why hasn't the EPA used its authorities under the Pollution Prevention Act to require e-waste pollution prevention activities?

Mr. DUNNE. We are tied in to Pollution Prevention but I don't think, as I said before, that products are produced for international consumption, not just consumption in the United States, so it

would be very difficult for us alone to do that under the Pollution Prevention Act.

I do understand that one of our goals is to reduce the number of materials and reduce and reuse materials. It just makes sense to us economically. We wouldn't be putting this kind of manpower and effort behind it like my colleague from Minnesota, if we didn't think this was a worthwhile effort.

Senator BOXER. I see my time has run out. That is fine. I look forward to your written responses.

But Mr. Chairman, I think we have a lot of good advice here from the Inspector General, from the GAO, some of Mr. Dunne's comments were helpful, some weren't but some were, and I think we have struck something here. My own view just from listening is maybe this issue just hasn't gotten the attention it deserves and maybe we can jump start it. I just want to thank ever member of the panel for answering the questions.

Senator THUNE. Thank you all very much.

We will move to our third panel. On this panel we have: Ms. Sheila Davis, executive director, Silicon Valley Toxics Coalition; Mike Vitelli, senior vice president, Consumer Electronics and Product Management, Best Buy Company, Inc.; Scott Slesinger, vice president for Government Affairs, Environmental Technology Council; and Richard Goss, director of Environmental Affairs, Electronic Industries Alliance.

Ms. Davis, if you would like to lead off, we would love to hear from you.

STATEMENT OF SHEILA DAVIS, EXECUTIVE DIRECTOR, SILICON VALLEY TOXICS COALITION

Ms. DAVIS. I am Sheila Davis, executive director of Silicon Valley Toxics Coalition. I want to thank you for the opportunity to speak to you today about a very important issue, electronic waste.

The problem with electronic waste in the United States is becoming critical. Discarded computers and other electronic products are the fastest growing part of the waste stream as we heard earlier. These produces contain a lengthy list of toxic chemicals as well. They also cause serious health problems which we know.

Less than 10 percent of discarded computers are currently being recycled, with the remainder getting stockpiled or improperly disposed of; 50 to 80 percent of e-waste collected for recycling is actually being exported to Asian countries which have no infrastructure to accommodate the hazardous properties of e-waste. Due to horrific working conditions and no labor standards in many other developing countries where e-waste is sent, women and children are often directly exposed to lead and other hazardous materials when dismantling electronic products to recover the few valuable parts for resale.

I don't know if you received a copy of the photo that was submitted earlier, but Silicon Valley Toxics Coalition as well as the Basil Action Network actually went to China several years ago to see what was happening with the materials and there is a video as well as photos. The photo submitted earlier is a photo of a woman squatting on the ground surrounded by e-waste and she has a hammer and a baron cathode ray tube which is the inner

part of the monitor and she is trying to knock off the copper in the back.

[The referenced document can be found on page 87.]

It says, here in the photo, you will see a woman who is working on dismantling. She is in Guiyu, China. You see that she has no protective equipment whatsoever, yet she is about to smash a cathode ray tube from a computer monitor in order to remove the copper-laden yoke at the end of the funnel.

The glass is laden with lead but the biggest hazard the woman faces is inhalation of the highly toxic phosphor dust coating inside the CRT. The monitor glass is later dumped in irrigation canals and along the river where it leaches lead into the groundwater. The groundwater in Guiyu is completely contaminated to the point where fresh water is trucked in constantly for drinking purposes.

Why does the computer that I turn in at my local recycler event in California end up in China at this woman's workplace? Why didn't my computer get dismantled and recycled here in the United States like I thought it would?

The answer is that the market for recycling e-waste here doesn't exist. The recycled materials used in these products are so toxic, it is very expensive to recycle them. There are some good recyclers who are actually trying to recycle products as extensively as technology allows but this requires manual processing and protecting workers from exposure to the toxic chemicals is very expensive.

The economics just don't work for most recyclers so they look for the cheaper, low road solutions and cream off the parts for which there are local markets and ship the rest across the ocean to become someone else's problem or they use low wage prison labor in the United States for disassembly which further undermines the chances for a healthy recycling market in this Country.

How do we fix this problem? We think the solution is to create incentives for the market system to work here. We need to do two things to make that happen. First, we need the products to be easier to recycle. The economics of recycling will never work unless these products are easier and therefore, cheaper to recycle. Part of that means using less toxic materials and part of that means designing them so that they are more easily disassembled for recycling without relying on prison labor or women and children in China.

Here is an example of what I mean by designing for recycling. For example, a local to California representative of a printer manufacturer told me a discouraging story about recycling at his company. He said that designers worked with the recyclers and found that if they simply added a part that was less than a dollar, a component part, to the new line of printers, it would make the printer easier to disassemble and cheaper to recycle but the design team was told not to include the part because there is no guarantee that the printer would be recycled. So the added cost could not be justified. Here the producer was not motivated to change the design because they were not concerned about the recycling end of life for their product.

The second thing we need to do is to get the producer to take responsibility for the product at the end of the product's life so they do have this incentive. If the producer, and here I mean manufac-

turers and brand owners, have no connection to or responsibility for their products at disposal time, then what incentive do they have to modify their design for better recycling or even better reuse for their products? The answer is none. They have no incentive to do anything different.

What if companies did have responsibility for taking back their products for recycling? What if that was just a normal part of operation, that each company had to recycle a significant portion of its own products each year? They would simply build these take back and recycling costs into their products' pricing structure.

To be competitive and to cut the recycling costs, they would innovate, redesign and end up with computers that were cheaper to recycle. Less toxic materials would be used so recycling would be easier and cheaper and there would be no reason to even think about having perhaps taxpayers pay to solve some of these problems. The market would really work better and work for us.

This legislation we are encouraging our lawmakers to adopt, this legislative approach I should say is a call to producer responsibility and this is far reaching and it is probably more complex than we can go into today in testimony here, but we think it is the only solution that will correct the market forces that currently send my computer and yours too into landfills or to a village in China or into prisons.

My message here today is this is a big picture problem that really calls for big picture solutions. It won't be solved just by the tax credits or just by a front end fee paid at point of sale. I encourage you as lawmakers to seek the kinds of changes that will actually make the market take care of the problem of electronic waste.

Senator THUNE. Thank you, Ms. Davis.

Mr. Vitelli.

STATEMENT OF MICHAEL VITELLI, SENIOR VICE PRESIDENT, CONSUMER ELECTRONICS AND PRODUCT MANAGEMENT, BEST BUY COMPANY, INC.

Mr. VITELLI. I am Michael Vitelli, senior vice president of Consumer Electronics at Best Buy. I am here today on behalf of the Consumer Electronics Retailers Coalition. This is my first committee hearing also. CERC appreciates the opportunity to provide the views of the consumer electronics and general retail industry concerning the need for a national approach to handling electronic devices at the end of their life. We look forward to working with you and members of this committee to identify the best means of developing a national solution for electronic device recycling.

Best Buy is the Country's leading consumer electronics retailer with close to 700 stores in 49 States and nearly 100,000 employees. The company started back in 1966 with a single store in St. Paul, Minnesota and we continue to operate our headquarters in the Twin Cities today. In addition to our products and services offerings, Best Buy is also known for our commitment to our communities, providing volunteer support, financial resources and leadership on many issues but especially on the use of innovative technology to improve learning opportunities for children.

Best Buy is also actively concerned with the issue of electronic waste. In 2001, we launched a series of recycling events to provide

a simple and convenient program for recycling electronics that protects the environment while raising awareness of recycling options. Through these events, Best Buy has helped consumers nationwide recycle over 2.5 million pounds of electronics in an environmentally responsible way since the program began. We also offer the ability to recycle cell phones, ink cartridges and rechargeable batteries year round in all of our U.S. stores.

CERC is a national coalition representing consumer electronics retail businesses and associations that operate in all 50 States and worldwide. Joining Best Buy in CERC are Circuit City, Radio Shack, Wal-Mart, Target, the North American Retail Dealers Association and the Retail Industry Leaders Association. Our goal at CERC is to educate, advocate and instill continued consumer and market confidence in consumer electronics policy issues.

The most important point I want to make here today is that the Country needs a national solution to the issue of electronic waste. In the first half of 2005 alone, 30 States and local legislators saw more than 50 separate bills introduced on this issue including an e-waste measure introduced and still active in New York City. So 50 differing and potentially conflicting approaches will be administratively unreasonable and infeasible for manufacturers and retailers alike and will not lead to a comprehensive and efficient electronics waste management system for our Nation.

While retailers have a limited role in the life cycle of the product we sell, consumer electronics retailers realize we have a responsibility in working with interested stakeholders, retailers, manufacturers, distributors, recyclers, public interest groups, charitable organizations, State and local governments and indeed our consumers themselves all have a role in advocating for the development of a successful, national electronics waste management system.

Both consumer electronics and general retailers unanimously support a shared responsibility approach to handling electronic devices at the end of their life cycle. While other stakeholders have yet to reach a broad consensus, consumer electronics and general retailers, including their national and State federations, have come together. CERC drafted a consensus legislative position paper supporting a producer responsibility model based upon internal discussions, industry wide and meetings with policymakers.

Since issuing this position paper, CERC has been working with and recruiting broad, across industry support among other interested stakeholders including environmental groups, recyclers, State legislators and manufacturers. Our members oppose a point of sale, advance recovery fee system at the State level because we know from firsthand experience that such an ARF will not accomplish its goals. It is an administrative burden for all parties and while it guarantees a new revenue source for Government, it does not guarantee there is an effective recycling system put in place or that the fees are adequate to support that system. In addition, such a program provides no incentive for the design of more environmentally friendly products and fails to take advantage of market forces to reduce the cost of recycling over time.

While retailers and others believe that the producer responsibility approach is the most fair, least burdensome and perhaps the

most easily managed model, we have also looked upon the Talent-Wyden Electronic Waste Recycling Promotion and Consumer Protection Act that would provide that limited tax credit to recyclers and to consumers as an excellent model that could jump start a national capitalization of e-waste recycling.

Even without State or Federal laws governing management of electronic waste, the private sector, manufacturers and retailers, working with qualified recyclers, are fully supportive of a shared responsibility approach as evidenced through the numerous voluntary initiatives that collect and recycle today. CERC members and other consumer electronics retailers and manufacturers have participated in such EPA programs as the Plug-In To eCycling Outreach Campaign which works to increase the number of electronics devices collected and safely recycled in the United States. Partners in this EPA program have included manufacturers like Panasonic, Sharp, Sony, JVC, Lexmark, Dell, Intel, retailers like our company, Best Buy, as well as Staples and Office Depot and approximately two dozen State and local governments.

More than 26.4 million pounds of electronics were collected in the first 10 months of this national program alone. In addition, a number of retailers and manufacturers have taken part in other voluntary programs to encourage greater recycling. As I mentioned earlier, Best Buy actively provides recycling options for our customers and our recycling events.

We had an overwhelming response to one in our headquarters in Minnesota over a month ago that drew record crowds and we had 2,900 cars and collected over 250,000 pounds in just 2 days. Another event is scheduled next week at our Mira Mesa, CA store and we are very excited to be partnering with HP and Sony in this event.

We all realize that voluntary programs cannot fully handle or solve the end of life issues involving consumer electronics and CERC strongly believes that a comprehensive, nationwide approach to the matter of electronics is the ultimate solution. We further believe that a successful national system can be established without imposing fees at point of sale, without having to create a new complex administrative structure, and without mandates that discourage innovation. That is why the Talent and Wyden Act seemed to many of us a cost efficient and potentially successful national program. We urge you to consider this proposal as a viable and creative opportunity to deal with electronics at the end of their lives.

The members of CERC together with consumer electronics, general retailers and their trade associations throughout the United States want to be constructive and contributing partners with lawmakers, manufacturers and others in dealing with these end of life cycle consumer electronics products. We cannot, however, afford to let individual States, individual cities and counties establish the wrong programs and impose inconsistent mandates on retailers and manufacturers and create confusion about the appropriate ways to handle electronics at the end of their life.

We appreciate the holding of this hearing and encourage Congress in general and this committee in particular to work toward a national solution on electronics waste management. We pledge to

work hard with you in arriving at a fair, viable and effective approach.

Thank you.

Senator THUNE. Thank you, Mr. Vitelli.

Mr. Slesinger.

STATEMENT OF SCOTT SLESINGER, VICE PRESIDENT FOR GOVERNMENT AFFAIRS, ENVIRONMENTAL TECHNOLOGY COUNCIL

Mr. SLESINGER. My name is Scott Slesinger and I am vice president for Governmental Affairs of the Environmental Technology Council. I want to thank the committee for requesting our views on the issues of e-waste. Our Council represents environmental service companies that recycle hazardous materials including e-waste and solvents. We also represent hazardous waste facilities permitted under RCRA.

Similar to the lead shielding used to protect dental patients during x-rays, the amount of lead in computers is significant but is a crucial component that protects the user from radiation emitting from the tube. Without toxic metals, disposal in a sanitary landfill would be a safe and available option, however, these facilities are not operated to protect the environment from the leaching of the volumes and types of lead that would be placed in these facilities.

In some communities, if you put a computer curbside in a garbage bag, it will be crushed, then incinerated and the lead and other contaminants will go into the air. Newer flat panel monitors do not use lead and glass but use mercury to operate efficiently.

If computers are hazardous toxic waste under the law, why are they being disposed of in non-hazardous waste landfills and incinerators? Congress exempted households and certain small generators from the hazardous waste regulatory regime. The belief at the time was that the volume of toxic waste from households would be minor and not a threat to the environment.

When communities became aware of the volume of lead being placed in their sanitary landfills, they grew concerned. About a quarter of the States passed laws treating CRTs as universal waste. Universal waste rules are clear and simple standards for managing widely distributed hazardous waste as compared to the more burdensome requirements intended for factories and similar facilities.

Essentially, the universal waste rules are a middle ground between the household rules which exempt waste from controls and the full RCRA subtitle (c) hazardous waste standards. EPA is establishing universal waste rules for items such as mercury thermostats and flourescent lamps.

An EPA advisory group that included State, Federal, environmental and industry officials recommended to EPA that CRTs be regulated as universal waste to ensure responsible recycling. However, we have learned that instead of requiring universal waste protections, EPA plans to finalize the rules that essentially deregulate these waste if sent to a domestic, unregulated recycler. EPA's proposed exemption from RCRA for CRT glass if followed by the States would represent a regrettable rollback in environmental protection.

We believe that other electronic waste including computer hardware and cell phones should also be regulated under the universal waste rules instead of the normal hazardous waste rules. Those who may argue that deregulation will lead to more recycling may be right but such unregulated recycling will inevitably lead to improper recycling, taxpayer financed cleanups and public cynicism of recycling. Those costs would dwarf the benefits of a possible chance of some increase for recycling.

The risks are not imaginary as Senator Talent mentioned a facility in Missouri. At a State convention of hazardous waste officials in 2002, State regulators described the recycling industry as a low profit, risky business with high turnover rates and inadequate insurance. The State regulators cited cases where low cost recyclers were merely sham operations who collected waste fees with no intention of doing any recycling. Many of these facilities have gone belly up leaving contaminated sites for States to clean up.

Despite EPA's proposed approach, many generators of computer waste want recyclers to have some certification, a good housekeeping seal of approval. EPA responded by establishing fairly good guidelines in the document, Plug-In To eCycling, Guidelines for Materials Management. However, these guidelines are only voluntary and their effectiveness as opposed to the promulgated University Waste Standards is unconvincing.

Many of our customers send computers to us for handling because our companies are protected. For instance, our member companies and legitimate competitors track the waste, train our employees, prepare spill prevention plans and hold environmental and closure insurance.

Under the proposed EPA CRT rule, our companies and competitors would not need to meet any of those requirements. Unregulated companies would be subject to RCRA only if they spill the hazardous waste on the ground but it is hard to imagine how that would become known. It would be difficult if not impossible for regulated entities to compete in such a system.

Today with commodity prices high, there have been many new businesses trying to make profits out of e-waste. When the price of the valuable components inevitably turns, these unregulated recyclers may fail and leave the taxpayer to clean up the toxic remains. We believe that whatever legal regime is established for recycling, the rule should require them to have financial assurance for closure, environmental liability insurance, employee training and some minimal waste tracking so consumers can be assured their discarded computers are managed properly.

The goal should not be to increase recycling, the goal should be responsible recycling that conserves resources, saves energy and enhances the environment.

Thank you and I look forward to any questions you may have.

Senator THUNE. Thank you, Mr. Slesinger.

Mr. Goss.

STATEMENT OF RICHARD GOSS, DIRECTOR OF ENVIRONMENTAL AFFAIRS, ELECTRONIC INDUSTRIES ALLIANCE

Mr. GOSS. My name is Richard Goss. I am the director of Environmental Affairs for the Electronic Industries Alliance, EIA. EIA

is the leading advocate for the $400 billion U.S. high tech and electronic industries. Our 1,300 member companies provide products and services ranging from microscopic electronic components to State of the art defense, space and industry high tech systems, as well as the full range of telecommunications, information technology and consumer electronics products.

EIA appreciates the opportunity to provide the views of our membership concerning the end of life management of our products. We commend the subcommittee for holding this hearing and advancing the dialog on this important issue. We would also like to thank Senator Wyden and Senator Talent for their efforts and leadership in this area.

EIA and our member companies support the safe and appropriate recycling of used electronics products to help meet the important environmental goal of increasing resource conservation and recovery. As manufacturers, we recognize that we are a key partner in the process and we will continue to work with Congress, Federal agencies, the States and involved stakeholders to address this challenge.

The ongoing commitment of our member companies to product stewardship, environmental design and recycling can best be demonstrated by a listing of some of our industry's concrete achievements. Through a combination of direct corporate efforts and innovative partnerships, including USEPA's Plug-In To eCycling Campaign, EIA member companies have been involved in the proper recovery and management of well over 1 million tons of used electronics products, well over 2 billion pounds.

In addition, EIA member companies use significant quantities of recycled materials including glass, metals and plastics in new generations of their products. EIA member companies are on target to be in compliance with the European Union directive on the restriction of hazardous substances, the Ross Directive, which will take effect on July 1, 2006. Since electronics products are manufactured for global sale and distribution, U.S. consumers will have broad access to products that comply with the new EU requirements.

As a result of our members' longstanding dedication to product stewardship and technological innovation, the electronics industry continues to achieve significant and sustained environmental progress throughout the entire product life cycle, from design through beneficial use to end of life. On the whole, every year our products become more energy efficient, use fewer materials of potential environmental concern and become easier to upgrade, disassemble and recycle.

EIA is currently compiling a record of member company achievements in the areas of product stewardship and design for the environment and we will be happy to share this document with the subcommittee once it is completed.

In summary, we support electronics recycling as a way to conserve and reclaim resources. However, this is a complex challenge that will require the coordinated efforts of all the key stakeholders to resolve. Given the complex nature of the challenge, EIA supports efforts to establish a viable recycling infrastructure in which all the major stakeholders, manufacturers, government retailers, non-gov-

ernmental organizations and recyclers participate based on the unique expertise and capabilities.

The combined goal of these institutional stakeholders should be to develop a recycling infrastructure that is convenient for the residential consumer. Implementing a system based on principles of shared responsibility will increase the efficient collection of electronics and ensure economies of scale by taking advantage of existing infrastructure.

EIA supports equitable, flexible and cost efficient solutions that encourage the proper management of used electronics while limiting additional cost to the public for these popular products. EIA also believes that it is essential to consider the science related to electronics products as part of any public policy discussion regarding recycling.

Certain compounds are present in electronics products such as lead and mercury that provide clear safety performance and energy and efficiency benefits. These compounds should be appropriately managed at the end of the life. USEPA shares this view and has consistently stated the used electronic products when properly managed do not represent a human health or environmental concern.

The agency considers electronics recycling as fundamentally a solid waste mangement and resource conservation issue. Likewise our member companies recognize that reusing and recycling electronics at the end of the life is the most environmentally preferable option and we support reasonable efforts to develop the recycling infrastructure.

As you know, three States have already enacted three very disparate statutes which address electronics recycling. Numerous other States and even some localities have either developed special regulations for handling of used electronics or are actively considering their own electronics recycling legislation. These approaches often include significant variations in terms of financing mechanisms, the scope of covered products, the roles and responsibilities of key participants and the overall regulatory structure.

Industry and other stakeholders are rightly concerned that potential confusion of State recycling laws and regulations will prove costly, inefficient and perplexing. There is clearly a role for the Federal Government to play in bringing national consistency to this emerging field. Federal action can help promote the safe and environmentally sound recycling by creating a streamlined and uniform regulatory framework that removes artificial barriers and instead encourages the free flow of used products for proper management.

Specific steps include: establishing consistent regulatory definitions of key terms and strictly defining the scope of covered products through the application of fixed criteria; considering the establishment of a flexible third party organization that can help with roles such as data reporting, compliance and financing; ensuring broad consistency in labeling product information and regulatory reporting requirements; and assessing whether additional recycling regulations or standards are necessary to ensure the safe and environmentally sound management of used electronics.

EIA and our member companies stand ready to work with the subcommittee on these and other initiatives.

Thank you again for the opportunity to share industry's position on this important issue and I would be pleased to respond to any questions.

Senator THUNE. Thank you, Mr. Goss.

I am now going to turn to Senator Boxer for questions.

Senator BOXER. I know that is a favor to me because I have a 4:30 I have to attend but this has been a terrific panel. I do appreciate all of your. Every one of you has made a tremendous contribution at least to this Senator's understanding of this.

Mr. Vitelli, thank you for what you do to recycle these products, take these products back. I guess what I am interested in is what you do with them once you get them?

Mr. VITELLI. We work with qualified recyclers in the various States that we do that and with the manufacturers who participate with us. In some cases, they are the ones taking the product to the right place.

Senator BOXER. So you don't send them to China?

Mr. VITELLI. No, we do not. In fact, our RFQs with recyclers we work this, one of the key things in there is the fact the product will be recycled in the United States.

Senator BOXER. I am glad. That makes me very proud of what you are doing.

I was on a local county board years ago in the days we didn't think about recycling anything, paper, plastic, definitely not plastic, aluminum cans and we realized that there could be a profit in this. I am wondering whether you in this effort break even on this, make money, do you lose money? What do you think at the end of the day?

Mr. VITELLI. You mentioned it earlier. There is not a tremendous profit in this, you are actually paying for the removal of waste.

Senator BOXER. So it is a cost?

Mr. VITELLI. It is a cost literally and it is going to be a function of who ends up paying for the cost.

Senator BOXER. I think that is really important. You are doing the responsible thing and it is costing you something. You are getting goodwill out of it, getting people into the store. That is very good but still I think we need to consider that there needs to be a more equitable type of system.

Ms. Davis, thank you so much for sending us this photo. The chairman and I were looking at this photo of the woman not really having a clue of what she is doing here, with no protective clothing or anything like that. How widespread a problem is the export of electronic waste to countries that lack adequate environmental protections?

Ms. DAVIS. There is an estimate of about 80 percent of the materials that are accumulated in the United States are exported.

Senator BOXER. Who are the major exporters?

Ms. DAVIS. They are basically companies that are sometimes front men for recyclers. If you give your product to or drop it off at a recycle, they might collect it but will put it in a shipping container, give it to a broker and the broker will ship it overseas. That is where most of the waste ends up.

Senator BOXER. Let me understand this. People go to a recycle?

Ms. DAVIS. Go to a local recycle.

Senator BOXER. Do they pay them the fee to take the computer?

Ms. DAVIS. It depends on what State you are in. Most States don't have a fee.

Senator BOXER. So what is in it for this person?

Ms. DAVIS. The recycler will cream off the good computer, so some of the computers can be reused, they will take some of the valuable metals, some of the valuable chips and the rest is basically waste. The monitors basically do have some valuable parts like copper but it is very hard to recovery.

Senator BOXER. They pay the broker out of their profits to get the stuff out?

Ms. DAVIS. It depends. Sometimes the broker will actually pay them up to 2 cents a pound or so.

Senator BOXER. You say 80 percent of the waste is winding up in these countries?

Ms. DAVIS. It is estimated 80 percent but I don't think anyone in this Country is actually keeping track.

Senator BOXER. I think this is amazing, Mr. Chairman. With all we do for good will, this is something we need to look at, what is happening.

Scott, thank you for being here. EPA acknowledges that cathode ray tubes can leach four times the amount of lead as regulated hazardous waste. We got that out of the EPA today. It is in their rule. Electronic waste can also contain mercury, cadmium and other toxic substances. However, EPA has stated that municipal landfill standards are sufficiently protective to hold electronic waste. Do you agree with that?

Mr. SLESINGER. No. I think it is clear it fails EPA's test for what should not go into a municipal landfill. A similar test used by the State of California also failed the test. All landfills are different. It tries to mimic the average landfill. Certain landfills will probably leak more than others but if it is a hazardous waste and it is coming from Best Buy, Dell or a computer company, it can't go there. If it isn't recycled, it should go to a hazardous waste landfill.

Hazardous waste landfills don't just put it with regular garbage and dump it into the landfill, they encapsulate it with a plastic and then use a reagent that goes around the material four inches thick that makes it so what was in there, lead, mercury, doesn't leach out and then it is put into a landfill. Then it is much more protected.

Senator BOXER. Let me understand. Right now, there is no EPA rule to stop it from going to municipal landfills?

Mr. SLESINGER. Not exactly. The EPA rule generally says if you have a waste and it fails the EPA test, in this case for lead, which it fails, it should go to a hazardous waste landfill. A lot of the major manufacturers and retailers do send to our facilities for either recycling or for disposal. Most companies would rather have it recycled. We try to recycle as much as possible. In fact, today we are recycling all the hazardous materials in the computers but have to landfill the non-hazardous plastics and others because there is no market for those materials.

Senator BOXER. Is there any rule of the EPA that these products have to go to a hazardous landfill?

Mr. SLESINGER. Yes.

Senator BOXER. There is a rule. So they can't show up in municipal landfills?

Mr. SLESINGER. Unless it is a household which is exempt or a small quantity generator who is exempt.

Senator BOXER. But household is exempt?

Mr. SLESINGER. That is correct.

Senator BOXER. That is a lot. We are talking here, looking at the TV sets, many millions of these TVs. How many did you say?

Ms. DAVIS. Two hundred and eighty-seven million.

Senator BOXER. Two hundred and eighty-seven million analog TVs, if everyone just takes it to a municipal landfill, that is a lot of dangerous waste in municipal landfills.

Mr. SLESINGER. The alternative is if somebody does a pick up like a manufacturer or retailer, then it would go into the hazardous waste stream.

Senator BOXER. That is why what Mr. Vitelli is doing is so responsible because he is making a point to try to do that.

I am going to ask one last quick question to you, Mr. Goss, because the whole panel is so good and you have so much information.

I wanted to ask you about your member companies that are complying now with the European Union requirements. To what extent will Europe's requirements provide your member companies with a system that we could duplicate here and that you could duplicate here in the United States? Is it onerous over there or are you learning ways to live with what they are recommending?

Mr. GOSS. You are referring to the electrical waste?

Senator BOXER. Yes.

Mr. GOSS. The jury would still be out on that. The directive has not been implemented yet. It is scheduled to go into effect in August of this year. Several companies, the United Kingdom, France, have had difficulties in terms of transposing the directive so far and we are waiting to see exactly how it works in practice.

Senator BOXER. Transposing it from the law into pragmatic rules?

Mr. GOSS. My understanding also is that in numerous countries they have yet to set down the regulations and the registration requirements.

Senator BOXER. Couldn't it just be done by the European Union or be different for each?

Mr. GOSS. I am not an expert on the we approach but I believe each country has certain registration and regulatory requirements but we can certainly check on that.

Senator BOXER. Mr. Goss, would you keep the chairman and me informed as to how it is going over there, if it is a total nightmare or if they are coming up with ideas that we could look at?

Mr. GOSS. We certainly will and in fact, we will keep a close eye on it because we are interested to see how it works in practice once it is implemented.

Senator BOXER. I think it is good for all of us. Again, I want to thank you, Mr. Chairman and our terrific panel. Thank you all.

Senator THUNE. Thank you, Senator Boxer. I would echo what the Senator from California said. I think you have been a very enlightening and informative panel. Hearing about what is happening

out there and some of the good things that companies like Best Buy are doing is encouraging to hear.

Hopefully it gives us a bit of an idea and perspective on what we might or might not be able to do in terms of a national solution, if that is something we decide is necessary based upon the data collected about the risks associated with the stream currently heading into these landfills and will probably only increase in the future as we dump more and more of these, particularly the older television sets.

Mr. Goss, I want to ask you during Ms. Davis' remarks, she mentioned the needs to make products easier to disassemble and I think if you look at the General Accountability Office's study it also points out that 50 percent of the cost recycling is in the labor and the companies currently doing that, it becomes almost prohibitive at times depending on the value of some of those materials to recycle.

How would a requirement to make those products easier to disassemble impact the durability of the electronics consumers buy today? How would that affect the quality and the workmanship and all that? It is in the GAO study, and I don't have it in front of me, but talked about $1 per screw or something like. HP spent a $1 in additional design costs to reduce a number of different screws in each computer and would save Niranda, which does these disassemblies, $4 cost. Do you sacrifice something in terms of durability and quality?

Mr. GOSS. I would have to check with some of my individual member companies on that. Certainly there are a lot of advances that our companies have made and as I said in the compilation we are going to be sharing with the subcommittee some of those and be detailed in terms of the advances we made, in terms of designing for ease of upgrading and recyclability and reuse. I can get some specific information for you on that. I would imagine there are probably several innovations out there right now that would allow products to be recycled easier without compromising any of the performance.

The other point I would make is that we will be dealing with recyclers as we do to find out the break down and exactly what makes it easier for them to recycle because as manufacturers, we know how to put the products together but we need that knowledge base and what makes it easier for them on their end to disassemble it.

One related point is the transportation costs for the materials I think are far and away the largest single bulk of the cost involved with recycling.

Senator THUNE. Were members of your organization members of this NEPSI group in 2001?

Mr. GOSS. Yes, we were.

Senator THUNE. I guess the industries would prefer a national framework so that you don't have to comply or deal a patchwork of State requirements but it sounds like the consensus reached as a result of those meetings was they couldn't come to a consensus on what a national system or framework might look like. At least that was what I was told, that in 2005 those efforts dissolved because the stakeholders couldn't reach agreement.

Could you explain some of the market competitiveness issues that have prevented your association from being able to advance a consensus position on what a national framework might look like?

Mr. GOSS. Certainly. The first point I will make is that our industry as a whole, all the companies recognize the importance of this issue and that we are a key player in this issue. For us, it is not a question of whether we should be involved in recycling, that question has already been answered in the affirmative.

The question is how to finance it. Based on different companies with different product lines, different sales and distribution models and experiences in the market, there are some very market differences in terms of what they see as a fair and equitable approach to this recycling challenge.

We went through well over a year of intimate industry discussions to try to come to a consensus on this. It was a lot of commitment to try to come up with something everyone could agree with. Those discussions are still ongoing. We still have hope we will be able to reach a consensus industry position on this but for right now, there are marked differences of opinion in terms of what the different players believe is fair and how it works to competitive advantage.

Senator THUNE. Mr. Slesinger, GAO's testimony talked about the amount of precious metals found in computers and other electronics. Why don't we see a larger U.S. business interest in recovering some of those precious metals like gold and copper, aluminum and platinum found in some of those products?

Mr. SLESINGER. The reason has to do mostly with labor costs. There might be a little bit of gold in some computers but finding it is very costly. EPA testified last week they thought recyclers were getting $1-$2 worth of valuable product out of a computer which they had to charge $15 to take apart. In fact, the metal prices are such that for instance today, if we send the glass to a glass company that makes new leaded glass, it doesn't cost us anything for them to take it and we don't get anything from it.

What we find the most profitable part of a computer is if we can get a computer that is newly discarded, its hard disk or particular chips or other parts of it may have a resale value and that is really the value. An efficient way to mining for the gold has not been shown yet.

Senator THUNE. Mr. Vitelli, if I were wanting to drop off an old computer I have sitting in my closet, how does your collection program work? There is a Best Buy on 41st Street in Sioux Falls, SD. Do I just take it down there? How does that work?

Mr. VITELLI. Currently, the programs we are doing have been voluntary with the manufacturer in a particular city or a particular State, so there isn't a comprehensive recycling program for computers today. We would actually look to whatever that particular city or State program may or may not be at that time, but there isn't a comprehensive here is what you do nationally or that particular store now.

Senator THUNE. So it is sort of State to State, store to store, so to speak.

Mr. VITELLI. More voluntary versus anything else.

Senator THUNE. I have a question or two for Ms. Davis dealing with the issue raised earlier about extended producer liability which I think you suggested needs to happen. You mentioned in an attempt to reduce the amount of e-waste in the future, manufacturers need to have more responsibility for their products at disposal time which is one solution some of the States have implemented, some have front end fees, some have held the manufacturer responsible.

If you didn't have a Federal mandate of extended producer responsibility, how would you see the Federal Government doing it? Would you have to impose a national mandate or is there another way of accomplishing the same objective I guess is the question I am asking?

Ms. DAVIS. There would have to be some type of Federal law that would level the playing field for all the manufacturers to actually take some responsibility for their product at the end of life. That could mean there could be a third party, as Mr. Goss suggested, that can actually set up a system that would take back the products and set up some type of standards for the manufacturers to abide by and the manufacturers would pay into that third party in order to have their products recycled or they can go directly back to the manufacturer. For example, when you purchase a computer, you should be able to return your old computer and that manufacturer would take responsibility and recycle it for you.

Senator THUNE. If you create a third party, you have to figure out a way to finance, correct? In any of these scenarios, you are talking about some sort of way of paying for this. Manufacturers probably aren't going to volunteer, are they?

Ms. DAVIS. No. I guess if they were going to volunteer, they would be doing it now but there would have to be some type of regulation or laws or framework put in place that would allow them to operate as a third party or operate with a third party and pay into it, I imagine.

Senator THUNE. Somebody mentioned today there ought to be a way of doing this without a front end fee or something like that, but it seems to me if the responsibility is placed upon the manufacturer, the producer, the producer or the manufacturer is going to pass it on to the retailer, the retailer is going to pass it on to the consumer.

At some point, somebody is going to pay for this process unless there is enough incentive in the recycling side of it to encourage people and that is where I am kind of coming back to the Talent-Wyden bill, if in fact that creates enough incentive for either individual consumer buyers of these products or certified retailers to get in the business of recycling these products?

Ms. DAVIS. If the manufacturers were responsible for paying the cost of recycling, then they would have to find innovative ways to change the design and drive down the costs just as they find innovative ways to manufacture the product to drive down the cost without hopefully sacrificing labor and so forth or labor standards. But if there were some type of incentives, whether it is a liability, some type of government incentives around recycle content or some type of tax break around research and development, those could be built into the framework.

But I think the bottom line is that manufacturers, for the most part, need to incorporate the cost or internalize the cost for the recycling and for the end of life. That way they have some bottom line incentive to actually figure out how to do it cheaper.

For example, in California where there is a front end, the manufacturers aren't involved at all, they have no incentive to redesign their products, so people in California could basically pay for now $5, $6 or $10 and the fee will probably go up and not down over the years to recycle their products.

Senator THUNE. Mr. Goss?

Mr. GOSS. I would say in terms of the design for environment, clearly the Ross directive goes into effect in the EU next July but the point I would make is that our member companies have been innovating in design for environment and product sustainability for years on a voluntary basis and have made some wonderful technological innovations in terms of design. This is not something that has only come about due to several directives or State laws or what have you. We are certainly designing more for upgrading, for recycling, for reuse and will continue to do so because it is part of what the public and consumers demand.

Senator THUNE. As a consumer, we want you all to make those upgrades but to get the prices down.

Mr. GOSS. We will do our best.

Ms. DAVIS. I would like to note that I think the Ross directive with the restriction on hazardous substances in the EU as well as a redirective really truly has driven the manufacturers to change their practices. I think some of the manufacturers have done it on their own but again unless there is a level playing field for manufacturers, they are simply not going to be able to invest and manufacture products and stay competitive.

Senator THUNE. I want to thank you all very much for your testimony and for the light you have shed on the subject. It is not something that Congress has dealt with in the past. Clearly the States are beginning to deal with it. I think this is a way of defining and quantifying the problem, if there is a problem, and then trying to figure out what is the best way to come up with a solution.

That is the challenge we are going to face but certainly your testimony and presentations today will add a lot to the body of evidence to say as we move forward we will need to come up with solutions.

Thank you very much for your testimony.

The hearing is adjourned.

[Whereupon, at 4:41 p.m., the subcommittee was adjourned.]

[Additional statements submitted for the record follow:]

STATEMENT OF FRANK LAUTENBERG, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Mr. Chairman, thank you for calling this hearing and giving us an opportunity to learn more about this issue.

When I was a boy, my family was poor. We weren't ashamed of it, because everybody we knew was in the same boat.

When people don't have a lot, they make the most of what they do have. That's what people did when I was growing up.

If something could be used, it didn't get thrown away. Nobody could afford to waste anything.

During World War II, Americans saved tin foil and tires so the aluminum and rubber could be reused.

This was not only frugal—it aided the war effort and made our Nation stronger.

Today Americans own two billion electronic products—which works out to about 25 items for every single household.

On an individual basis, many Americans can probably afford to toss out these products when they become obsolete.

But as a society, we can't afford to do that. The environmental costs are simply too high.

Computers and televisions contain significant amounts of lead, mercury and other hazardous substances.

Tossing old computers into landfills creates tons of lead and mercury waste.

In fact, some experts predict one billion pounds of lead from electronics could enter our landfills in the next decade.

This would pose a serious threat of toxic runoff—and it would ultimately be an expensive problem to clean up.

We dispose of about twelve million computers every year. These fill up a lot of landfills. And in populated areas like New Jersey, landfill space is limited.

There is a better way.

Instead of throwing away these products, we should retrieve and reuse the resources that are salvageable.

Electronics are currently the fastest growing part of the waste stream, but fewer than 10 percent of old electronics products are recycled.

That has to change. Mr. Chairman, it is simply wasteful to continue throwing away old products that contain resources we could re-use.

Congress needs to join with the producers of these products in leading the way for change.

Thank you Mr. Chairman.

STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM THE STATE OF OREGON

Mr. Chairman, America is a computer-dependent society. I'm willing to bet that before coming to this hearing, almost every person in this room used a computer to write a document, to check e-mail, or to read the news. Yet as much as we depend on our computers, we seldom think about what they're made of. Let me tell you.

The desktop computer in your office right now contains about 14 pounds of plastic, 4 pounds of lead, 8.5 pounds of aluminum, more than 12 pounds of iron, half a pound of nickel and lesser amounts of arsenic, cadmium, mercury, titanium, zinc, beryllium and gold. There's mercury in LCD and gas plasma screens, lead in monitors and circuit boards, cadmium in chip resistors and semiconductors and heavy metals in CPUs. And every year, millions of newly obsolete computers—and televisions, and other electronic trash or e-waste—are discarded to the tune of 2.2 million tons. Those 2.2 million tons of e-trash are the equivalent of 219 Boeing 737 jetliners. If handled improperly, this hazardous stew of toxic e-waste can poison water supplies, people and the environment. But there is a better way.

Today, barely one in 10 computers gets recycled or reused. Compare that to old cars: 94 percent go to scrap yards where useable parts are reclaimed, and the rest of the material is shredded, compacted and recycled into appliances, cars and other products.

Senator Talent and I believe that the United States can put less e-waste in the landfill and more in the recycling bin. We have proposed S. 510, a pro-consumer, pro-environment and pro-technology bill to jumpstart a nationwide recycling infrastructure for electronic waste. Our bipartisan approach is the first to rely on incentives, rather than upfront fees or end-of-life penalties, to deal with electronic waste. Our legislation offers incentives to consumers and small businesses to get their old computers and laptops out of the closet and into the e-waste stream. Our legislation offers manufacturers, retailers and recyclers incentives to recycle e-waste. The bill has the support of retailers, electronics manufacturers, and environmental recyclers.

Specifically, our legislation would:

Establish an $8 per unit tax credit for companies that recycle at least 5,000 display screens or computer system units per year;

Establish a $15 tax credit for consumers who recycle their old computers and TVs, provided they use qualified recyclers;

Prohibit the disposal in a municipal solid waste landfill of any electronic equipment with a display screen larger than 4 inches or any computer system unit, beginning 3 years after the bill passes if EPA finds that the majority of U.S. households have reasonable access to e-waste recycling;

Modify EPA's universal waste rule to classify screens and system units as "universal wastes" to allow for easier collection, processing, transportation and recycling;

Require Federal executive agencies to recycle or reuse their display screens and CPUs; and

Direct EPA to recommend to Congress the feasibility of establishing a nationwide e-waste recycling program that would preempt any state plan within 1 year.

We do not claim to have a monopoly on the wisdom for how e-waste should be recycled, and so the tax credit is limited to 3 years. Our goal is to get a recycling infrastructure launched, and in the meantime, have EPA look at various options, at what various states are doing and come up with recommendations for Congress for a nationwide e-waste recycling plan.

The bill recognizes that states like California have already put a plan in place, and that many other states, like Oregon, are moving in that direction. But if every state and hundreds of municipalities and counties take different paths to solve the e-waste problem, the country will end up with a hodge podge of rules and regulations. Companies and consumers who are keen on doing the right thing will be confused, innovation will be stifled and not a lot of recycling would get done. One nationwide program seems to make the most sense.

Last week the New York Times carried a story about computers so infected with spyware and adware that they are on life support. Rather than going through the painstaking process of debugging them, consumers opt to toss them out and pay several hundred dollars for a new one. Unless some miracle cure is found, the spyware plague is not going away anytime soon, and the number of discarded computers will grow.

Then there's the transition to digital television, which could pull the plug on analog television sets in 21 million American households. The hand-over of the old analog channels could take place in the next 4–5 years. Unless the U.S. gets serious about recycling electronic trash, what is going to happen to all those old tv sets?

It is not very often Congress has the chance to get a jumpstart on solving a problem. This is one place where a bipartisan effort can make a real difference. I look forward to working with you to get a nationwide electronic waste recycling program launched.

STATEMENT OF HON. JAMES TALENT, U.S. SENATOR FROM THE STATE OF MISSOURI

I would like to thank Chairman Thune and Ranking Member Boxer for holding this important hearing on electronic waste, the first of its kind in the Senate.

There are roughly 50 million computers and 20 million televisions disposed of every year, some are illegally dumped, some are recycled, and others are just thrown away with the garbage. Computer monitors and televisions are a potential threat to our environment since they contain four to eight pounds of lead as well as other harmful materials. Because it's not always convenient to recycle computers, TVs and their parts, a lot of people store them in their basements, attics and backyards or just throw them away. According to the EPA, U.S. households have an average of two to three computers and televisions that they are not using in storage. That's about 70 million computers and televisions nationwide sitting around, collecting dust and potentially harming the environment.

One of the largest illegal computer dumps was located in Rolla, Missouri. Someone was running an illegal computer recycling business out of a rented building on the property. Instead of properly disposing of the computers, the man collected over 15,000 monitors and dumped them. Cleaning up this illegal dump cost Missouri taxpayers hundreds of thousands of dollars.

To avoid these types of hazardous and costly situations, Senator Wyden and I have introduced legislation that creates the first-ever nationwide infrastructure to deal with e-waste. The "Electronic Waste Recycling Promotion and Consumer Protection Act" (S. 510) gives tax credits to consumers as well as to manufacturers, and retailers for recycling old or unwanted computers and TVs. Importantly, this tax credit is completely voluntary. If folks don't want to recycle their old TVs and computers, they don't have to and there will be no penalty, which is where the law is now.

Here's how the legislation works: There is a $15 credit, which is a one-time deal for people like you and me that may have a computer or TV in our basements. To get the credit, you must submit with your tax return proof that the recycling was done by a qualified recycler.

There is also a small business credit, which operates like this: An $8 credit is available to anyone who collects no less than 5,000 TVs or computers in a given year and proves that they are recycled by qualified recyclers. They just have to submit

with their tax returns a record of who recycled the computer or TV and where it ended up.

We want to encourage people to do the right thing and recycle by developing a national solution, which is most desirable in the long run to avoid manufacturers and retailers from dealing with a patchwork of 50 different state laws. This legislation will also help domestic manufacturing as companies will use the tons of recycled materials to make new computers and other electrical and industrial products.

Further, it is pro-consumer since folks will have an incentive to recycle an old computer or TV and take the tax credit or use the money toward the purchase of new technology. Presently, consumers are actually discouraged from recycling e-waste since the garbage collector doesn't always collect it, folks don't know how to otherwise dispose of it, or manufacturers charge fees to recycle the technology. This bill helps move us in the right direction by providing people with incentives, rather than disincentives, to be environmentally responsible.

I am pleased that we are working with a broad business and environmental coalition support this common sense, pro-business, pro-technology and pro-environment solution to e-waste. In particular, I want to thank the Missouri Recycling Association and its 163 individual and business members for endorsing this first-ever Federal electronics recycling bill.

Thank you for letting me join you today to discuss this pro-job, pro-technology and pro-environment legislation.

STATEMENT OF HON. MIKE THOMPSON, U.S. REPRESENTATIVE FROM THE STATE OF CALIFORNIA

Good afternoon and thank you for inviting me here today to comment briefly on electronic waste or "e-waste". I appreciate Chairman Thune and Ranking Member Boxer allowing me to be a part of this hearing on the subject of e-waste, an issue with which I've been involved since I first came to Congress.

Electronic devices are becoming smaller and lighter, but they also are creating an ever-growing environmental and waste disposal problem. That's because it's often cheaper and more convenient to buy a new PC or cell phone than to upgrade an old one.

Today, the average lifespan of a computer is only 2 years and Americans are disposing of 3,000 tons of computers each day. Consumers Union, publisher of Consumer Reports, recently estimated that the typical household could expect to discard approximately 68 electronic items over the next 20 years including: 20 cell phones, 10 computers, 7 TVs, 7 VCRs or DVD players and several answering machines, printers and CD players.

While e-waste contains a number of valuable materials that are recoverable including aluminum, gold, silver and other metals, it also contains a witches' brew of toxic material such as lead, mercury and cadmium. If not properly disposed of these toxic materials can cause health and environmental problems. For example, the glass of a typical computer monitor contains six pounds of lead. When this glass is crushed in a landfill, the lead is released into the environment.

There's a Native American proverb about stewardship, which says: "We don't inherit the earth from our ancestors, we borrow it from our children." To give you an idea of the potential legacy we are leaving future generations, the National Safety Council has projected that approximately 300 million computers are obsolete. If all 300 million units were discarded, this would involve nearly 1 billion pounds of lead, 2 million pounds of cadmium and 400,000 pounds of mercury.

Residents in my District are stalwart stewards of the environment, recycling a healthy amount of e-waste compared to other parts of the country. Last year alone, Napa County collected 214 tons of e-waste, approximately 3 pounds for each of the County's 136,000 residents. In comparison, Boston collected 330 tons and San Diego collected 270 tons.

But while Napa is tackling the problem of e-waste at a local level, we've done little to address the problem on a national scale. Some retailers and manufacturers have created voluntary recycling programs, but they are too small in scope to have a significant impact on the e-waste stream. Without a national recycling infrastructure consumers and businesses today are left with few choices for getting rid of their old computers, cell phones and other electronic devices. Most people shove them in a spare closet or corner and wait. When people do try to dispose of their e-waste responsibly, all too often it is shipped overseas. There, it and its toxins can land in riverbeds or in the hands of unprotected workers.

The buildup of e-waste on the local and state level has led California, Maine and Maryland to implement their own e-waste laws—each very different from the oth-

ers. Twenty-six additional states are also considering e-waste legislation. As states continue to develop their own approaches the need for a Federal solution only grows. Without Federal action both consumers and businesses will have to contend with an unmanageable patchwork of state laws.

My colleagues—Representatives Louise Slaughter (D–NY), Randy "Duke" Cunningham (R–CA) and Mary Bono (R–CA) and I formed the bipartisan congressional E–Waste Working Group with the objective of investigating possible Federal e-waste solutions and educating Members of Congress about the issue. At our first event, a forum entitled, "E–Waste: Is a National Approach Necessary?" we invited all stakeholders, including consumers, manufacturers, retailers, recyclers, environmentalists and nonprofits. All agreed on the value of a national approach to e-waste.

Again, I thank the subcommittee for bringing much needed attention to this issue and to gathering expert testimony on the problem of e-waste. I—and other members of the E–Waste.

STATEMENT OF THOMAS P. DUNNE, ACTING ASSISTANT ADMINISTRATOR, OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. Chairman and members of the Subcommittee, I am Thomas Dunne, Deputy Assistant Administrator for the Office of Solid Waste and Emergency Response at EPA. Thank you for inviting me to appear today to discuss electronics waste and EPA's interest in electronics product design and recycling. In 2002, we set in motion a plan of action to renew the emphasis on resource conservation in the Resource Conservation and Recovery Act (RCRA). At least since 1976, RCRA has included among its purposes a goal to reverse the trend of "millions of tons of recoverable material which could be used [being] needlessly buried each year."

Today, the RCC has become a national program, challenging all of us to promote recycling and reuse of materials and to conserve resources and energy. One key area of focus is electronics.

The use of electronic equipment has grown substantially in recent years. According to the Consumer Electronics Association (CEA), Americans own some 2 billion electronic products about 25 products per household. Electronics sales grew by 11 percent in 2004, and the same growth is expected again this year.

WHY WE CARE ABOUT ELECTRONICS AT EPA:

EPA has been actively involved in helping to improve the design and recovery of electronics for more than 8 years now. Our interest in electronics stems from three primary concerns:

(1) the rapid growth and change in this product sector, leading to a constant stream of changing offerings and wide array of obsolete and discarded products needing an appropriate response;

(2) substances of concern present in many products which can cause problematic exposures during manufacturing, recycling or disposal if not properly managed—the presence of these constituents has sparked the search for workable substitutes and development of better management practices; and

(3) the desire to help encourage development of a convenient and affordable reuse/recycling infrastructure for electronics, with an initial emphasis on TVs and PCs.

HERE I WOULD LIKE TO PROVIDE SOME ILLUSTRATIVE FACTS

1. Increasing volume of electronic waste.—Consumer Electronics including TVs and other video equipment, audio equipment and personal computers, printers and assorted peripherals—make up about 1.5 percent of the municipal solid waste stream (2003 Figures). This is a small, but growing percent of the waste stream. Consumer electronics have increased as a percent of municipal solid waste in each of the last few years that EPA has compiled data.

2. Recycling is limited.—EPA's latest estimates are that in 2003 approximately 10 percent of consumer electronics were recycled domestically, up slightly over previous years. The remaining 90 percent of used consumer electronics are in storage, disposed of in landfills or incinerators, or exported for reuse or recycling. EPA is now taking a closer look at the fate of all electronics waste such that the Agency can better account for the amount of electronic waste stored, disposed, or exported. But anecdotal information suggests that nontrivial amounts of consumer electronics are in storage or exported, rather than going to disposal in landfills.

3. Substances of concern in electronics.—While industry is making progress in making its products with less toxic materials, many products may contain sub-

stances of concern such as lead, mercury and/or cadmium. For example, older cathode ray tubes (monitors) in TVs and PCs contain on average 4lbs of lead, although there are lower amounts of lead in newer CRTs. These constituents do not present risks to users while the product is in use; indeed, they are there for a good reason. Lead shields users from electromagnetic fields generated while the monitor is operating. Mercury is used in backlights in flat panel displays to conserve energy. But the presence of these materials means that some electronic equipment may present a risk if not properly managed.

WHAT WE ARE DOING ABOUT ELECTRONICS

We are engaged in several broad scale partnerships with manufacturers, retailers, other Federal agencies, state and local governments, recyclers, non-government organizations (NGO's) and others to encourage and reward greener design of electronic products, to help develop the infrastructure for collection and reuse/recycling of discarded electronics, and to promote environmentally safe recycling of used electronics. I'd like to give you a little more detail about each of these efforts.

GREENING DESIGN OF ELECTRONICS

EPEAT.—EPA funded and participated in a multi-stakeholder and consensus-based process, involving electronics manufacturers, large government IT purchasers, NGO's and others, to develop the Electronics Product Environmental Assessment Tool (EPEAT). It was created to meet growing demand by large institutional purchasers for a means to readily distinguish greener electronic products in the marketplace. EPEAT is modeled on other environmental rating tools like the LEED's Green Building Rating system. It is expected to gain wide acceptance in purchases of information technology equipment by Federal and state government—and eventually by other large institutional purchasers of IT equipment.

The EPEAT rating system establishes performance criteria in eight categories of product performance, including reduction or elimination of environmentally sensitive materials; design for end of life; life cycle extension; energy conservation; and end of life management.

The multi-stakeholder team that developed EPEAT has reached agreement on the main criteria that will be recognized for environmental performance. Now, the tool is being readied for use; as part of this effort, a third party organization will be selected to host and manage the tool. The aim is to have the EPEAT system up and running by December 2005 or January 2006—at which time manufacturers will be able to certify their products to the EPEAT requirements and purchasers will be able to find EPEAT certified products in the marketplace. The first EPEAT certified products will be desktop computers, laptops and monitors.

Energy Star.—EPA recently made its best known brand, the Energy Star label, available for external power adapters that meet EPA's newly established energy efficiency guidelines. Power adapters, also known as external power supplies, recharge or power many electronic products—cell phones, digital cameras, answering machines, camcorders, personal digital assistants (PDA's), MP3 players, and a host of other electronics and appliances. As many as 1.5 billion power adapters are currently used in the United States—about five for every American.

Total electricity flowing through external and internal power supplies in the U.S. is about 207 billion kWh/year. This equals about $17 billion a year, or 6 percent of the national electric bill. More efficient adapters have the potential to save more than 5 billion kilowatt hours (kWh) of energy per year in this country and prevent the release of more than 4 million tons of greenhouse gas emissions. This is the equivalent of taking 800,000 cars off the road.

On average, Energy Star-qualified power adapters will be 35 percent more efficient.

EPA is promoting the most efficient adapters since they are commonly bundled with so many of today's most popular consumer electronic and information technology products.

Design for the Environment (DfE).—Over the years, EPA's DfE program has worked numerous times with the electronics industry to help green the manufacturing of electronics as well as electronics products themselves. DfE has worked with the industry on ways to green the manufacture of printed wiring boards, assessed the life cycle impacts of CRTs and flat panel displays and has also recently assessed the life cycle impacts of tin-lead and lead-free solders used in electronics.

One important ongoing project in this DfE realm is the joint government industry search for substitutes for tin-lead solder that have acceptable engineering performance and environmental attributes.

The DfE Lead Free Solder Partnership is providing the opportunity to mitigate current and future risks by assisting the electronics industry to identify alternative lead free solders that are less toxic, and that pose the fewest risks over their life cycle. The draft final life cycle assessment report for the tin lead and alternative solders is available now for public review.

(2) *Encouraging reuse and recycling, rather than disposal, at product end of life Plug-In To eCycling*—Plug In To eCycling is a voluntary partnership to increase awareness of the importance of recycling electronics and to increase opportunities to do so in the United States. Through Plug In, EPA has partnered with 21 manufacturers and retailers of consumer electronics as well as 26 governments to provide greater access to electronics recycling for Americans. In the first 2 years, the Plug In program has seen the recycling of 45.5 million pounds of unwanted electronics by program partners—all of whom have agreed to rely on recyclers who meet or exceed EPA's "Guidelines for Materials Management," EPA's voluntary guidelines for safe electronics recycling.

Last year, we launched a number of pilot programs with manufacturers, retailers and local governments to create more compelling opportunities for consumers to drop off our old electronics. These pilots succeeded in collecting over 11 million pounds of used electronics and demonstrating that, when the circumstances are right, retail collection can be a successful model:

• The Staples pilot in New England collected over 115,000 pounds in testing in-store collection and "reverse distribution" making use of Staples existing distribution network. In this pilot, trucks dropping off new equipment at Staples stores removed electronics that had been dropped off and took them to Staples distribution centers rather than leaving the stores with the trucks empty.

• The Good Guys pilot in the Seattle area collected over 4,000 TVs—double the quantity expected—by offering in-store take back and a low fee for drop-off countered by a purchase rebate.

• Office Depot and Hewlett-Packard worked together to offer free in-store takeback of consumer electronics in all 850 Office Depot stores for a limited time period. It resulted in 10.5 million pounds collected, more than 441 tractor trailer loads.

We believe these and other pilots sponsored by industry, states, and recyclers are generating critical data which will inform policymaking on electronics recycling. These pilots have proved crucial to testing out what works, what doesn't, where collaboration is possible and where it is not, what kinds of opportunities really get the attention of the consumer and what kind of material the consumer wants to recycle. And very importantly, what it costs to get electronics from the consumer into responsible recycling.

Federal Electronics Challenge—The Federal Government is a large purchaser of IT products. To help the Federal Government lead by example the Federal Environmental Executive and the EPA launched the Federal Electronics Challenge (FEC). The FEC is a voluntary partnership program designed to help Federal agencies become leaders in promoting sustainable environmental stewardship of their electronic assets. As FEC Partners, Federal agencies agree to set and work toward goals in one or more of the three electronics life cycle phases—acquisition & procurement; operations & maintenance; and end-of-life management. As of this month, the FEC has 54 partners representing facilities from 12 Federal agencies. All 12 Federal agencies are signatories to a national Memorandum of Understanding on Electronics Management and, in total, represent about 83 percent of the Federal Government's IT purchasing power.

Recent National Electronics Meeting.—Last spring, EPA hosted a National Electronics Meeting to take stock of where we are with our electronics programs and talk with stakeholders about what else is needed. The goal of the meeting was to identify collaborative strategies that will contribute to effective management of used electronics across the country. Nearly 200 representatives from industry, government, and the non profit community participated in this meeting.

A few of the collaborative strategies being developed include the following:

• Developing standards for environmentally safe electronics recyclers and a process for certifying these recyclers. EPA plans to take a leadership role in convening stakeholders to develop such standards.

• Further development of a centralized data repository for electronics recycling to collect nationwide market data/share by manufacturers and provide information and status on national, state and local e-waste initiatives (provides data on waste, geographic summaries and process/implementation data). This effort is being chaired by the National Center for Electronics Recycling (NCER) in partnership with EPA and other interested parties.

• Piloting a private multi-state Third-Party Organization (TPO) to support electronics recycling efforts in the Pacific Northwest. This project will explore how a multi-state TPO could assume responsibilities on behalf of manufacturers, like contracting for recycling services across state lines. This effort is being chaired by the NCER and the WA Department of Ecology with eight electronics manufacturers.

Even if the key collaborations noted above are implemented, there will remain some gaps in needed infrastructure. In the course of developing, implementing, and sharing information related to key infrastructure-related collaborations, EPA looks forward to working with stakeholders to identify and plan to address other infrastructure-related efforts.

EPA WILL WORK WITH OTHER ORGANIZATIONS MOVING FORWARD

EPA has been working with a wide range of stakeholders in a variety of forums, both domestically and, as appropriate, internationally. This approach has worked well, and we expect to continue to follow it in partnership with other Federal agencies such as the Commerce Department and with the Federal Environmental Executive.

CONCLUSION

I hope that I have given you a sense of EPA's electronics goals and how we work with partners throughout the product chain to achieve shared responsibility for a greener, recovery-oriented product cycle.

RESPONSES BY THOMAS DUNNE TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. The subject of electronics recycling is very broad and not all electronics are created equally. Some stakeholders point out the differences in addressing a console television versus a mobile telephone. The wireless industry has a voluntary program—would you agree that they are contributing to the proper management of wireless products?

Response. The cell phone industry has developed programs to make sure wireless products find their way back into appropriate reuse or recycling programs when they are discarded. A lot of manufacturers, service providers, and retailers of cell phones recognize their responsibility in helping to ensure safe recycling and are acting on it. We hope that the successes we've seen to date with cell phone recovery spearheaded by retailers, manufacturers and non-profits will continue and that these players will continue to build on their outreach efforts so that eventually all cell phones will be recovered and recycled back into useful products.

Question 2. Has EPA taken steps to facilitate the safe and cost effective recycling of end-of-line electronic equipment?

Response. EPA has been involved with the improvement of electronics design and recovery for a number of years now. EPA is engaged in a series of partnerships with manufacturers, retailers, recyclers, state and local governments, non-profit and other organizations, and other Federal agencies to encourage the improved design of electronic products, help develop the infrastructure for the collection and reuse or recycling of discarded electronics, and encourage the environmentally safe recycling of used electronics.

For example, EPA funded and participated in a process with electronics manufacturers, government technology purchasers, and other organizations to develop the Electronics Product Environmental Assessment Tool (EPEAT). EPEAT will help large technology purchasers identify electronics products that are designed in a more environmental friendly manner. More environmentally friendly electronics include products that are designed to be more easily and cost-effectively recycled. It is expected that EPEAT will be operating before the end of 2006 when manufacturers that meet EPEAT criteria will be able to certify their products. The initial electronic products eligible for EPEAT certification will be desktop computers, laptops, and monitors.

In addition, EPA has entered into a voluntary partnership with numerous electronics manufacturers, retailers, and state and local governments to develop the Plug-In To eCycling initiative. The aim of this initiative is to raise public awareness on electronics recycling and to increase recycling opportunities.

In the first 2 years of Plug-In, more than 45 million pounds of unwanted electronics products were recycled by Plug-In partners. EPA launched several pilot programs under the Plug-In banner last year with manufacturers, retailers and local governments to provide consumer electronics recycling opportunities. The pilots resulted in collection of more than 11 million pounds of used electronics at retail

stores, including New England area Staples, Seattle area Good Guys, and all Office Depot locations. All of this is helping to encourage growth of the electronics recycling infrastructure.

To help make sure that as electronics recycling opportunities increase, human health and the environment are also protected, we have issued voluntary safe recycling guidelines. These guidelines, issued under the Plug-In program, establish safe management practices for electronics recyclers.

EPA has also partnered with the Federal Environmental Executive and several other Federal agencies to launch the Federal Electronics Challenge (FEC). Given that the Federal government is such a large purchaser of information technology products, it is fitting that we lead by example. The FEC is a voluntary partnership of Federal agencies that have committed to develop a more sustainable environmental stewardship of their electronic products. Twelve Federal agencies have signed a Memorandum of Understanding on electronics management, which represents roughly 83 percent of the government's information technology purchasing power. Among the key goals of the FEC are to help promote further expansion of the electronics recycling infrastructure and safe recycling practices.

Finally, EPA continues to work with a wide range of stakeholders to further encourage the reuse and recycling of electronics products. Last Spring, the Agency hosted a National Electronics Meeting attended by representatives from industry, governments, and non-profit organizations to discuss electronics management issues. As a result of the meeting, collaborative strategies are being developed that include the development of a certification program for electronics recyclers, the development of a nation-wide electronics recycling data repository, and piloting a private multi-state manufacturer-led organization to help support electronics recycling efforts in the Pacific Northwest.

RESPONSES BY THOMAS DUNNE TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. Cathode ray tubes used in most televisions can leach significant quantities of lead into a landfill. The EPA's Inspector General (IG) recently criticized EPA's failure to finalize a rule stating how the agency would regulate these tubes. EPA began this rulemaking in 1998. When will EPA finalize its rulemaking on cathode ray tubes?

Response. First, we should clarify that many waste cathode ray tubes (CRTs) are currently regulated as hazardous waste under RCRA if they are being discarded. That is, the vast majority of color CRTs will exceed the criteria in the Toxicity Characteristic (TC) regulation for lead (5 mg/l, in the Toxicity Characteristic Leaching Procedure Test (TCLP) test; see 40 CFR 261.24), and so would be classified as RCRA hazardous on this basis (see Musson, et al., 2000, Jang and Townsend 2003, and Townsend et al., 2004). Large quantity generators of color TVs bound for disposal would be required to dispose of these materials in hazardous waste landfills or hazardous waste incinerators. The rulemaking that you reference in your question would not change this.

Most monochrome CRTs would not qualify as hazardous waste under the TCLP test for lead, but there are relatively few monochrome CRTs produced any more.

Color CRTS that would not be regulated as hazardous include those generated by households and conditionally exempt small quantity generators of hazardous waste (less than 100 kg/month of all hazardous waste). These may be disposed in municipal solid waste landfills under current RCRA regulations, as would all other types of hazardous waste generated by households and conditionally exempt small quantity generators.

As to the premise in your question that cathode ray tubes leach significant quantities of lead into landfills, EPA believes that the disposal of electronics—including those that qualify as household hazardous waste—in municipal solid waste (MSW) landfills is protective of human health and the environment if that disposal occurs in properly managed municipal solid waste landfills.

In 1991, EPA updated the MSW landfill criteria to ensure that these landfills will be protective of human health and the environment, even if they accept household hazardous waste or conditionally exempt hazardous waste. Recent studies indicate that landfill leachate from properly designed and operated MSW landfills is unlikely to cause drinking water contamination due to low levels of metals present in the leachate from these landfills, and due to leachate collection and treatment systems. There is ongoing research being undertaken by the University of Florida to further assess the effects of electronics waste in MSW landfills.

With respect to your specific question, the final rule on CRTs is currently undergoing interagency review and until this review is completed, we cannot say with certainty when the rule will be finalized.

Question 2. The value of leaded glass recently dipped to minus $200 per ton. This change reflects a shift in the consumer preference for different technologies, among other factors. Doesn't this drop in value affect EPA's rationale for exempting cathode ray tubes from hazardous waste regulations as a "valuable commodity"?

Response. EPA has no data indicating that leaded glass has the negative economic value mentioned in your question. In fact, according to very recent conversations with a glass processor, leaded glass sent for recycling to make new cathode ray tubes is worth at least $100 per ton. Although this figure is lower than it was when EPA proposed its CRT rule in 2002, it is still significant. In addition, CRT glass processors have recently stated that demand for leaded glass is still very high, and that the market for new CRTs in other countries is strong. We note that recycled leaded glass is necessary to make new CRT glass; raw materials such as silica are not considered an adequate substitute.

In contrast, processors who send leaded glass to lead smelters must pay the smelter approximately $140 per ton to accept the lead. The smelter then uses the glass as fluxing material and as lead feedstock. Broken glass from CRTs resembles industrial sand in composition and can therefore serve as a substitute for this sand in the fluxing process. The sand is inexpensive. CRT glass manufacturers have stricter quality standards than lead smelters for the type of material that they can accept.

Further evidence of the economic value of CRT glass is demonstrated by the cost savings realized by CRT glass manufacturers and lead smelters when using processed CRT glass. The use of processed CRT glass cullet benefits the manufacturer in several ways, such as improving heat transfer and melting characteristics in the furnaces, lowering energy consumption, and maintaining or improving the quality of the final product.

Question 3. Toxicity tests have shown that cathode ray tubes can leach four times the amount of lead as material that is regulated as a hazardous wastes. The EPA's IG recently noted that EPA is testing other types of electronic waste for their hazardous characteristics. What types of electronic material has EPA tested for its hazardous characteristics or plans to test for such characteristics?

Response. EPA has funded studies by researchers at the University of Florida at Gainesville on the RCRA status of a variety of waste electronics devices (see Townsend, et al., 2004). These include (excluding CRTs): Computer CPUs, Laptop computers, Cell phones, Computer printers, Keyboards, Computer Mice, TV Remote controls, Smoke Detectors

Question 4. What are the results of any tests that EPA has already conducted?

Response. From Townsend 2004:

CPUs: 1 out of 22 computer CPUs tested using the TCLP exceeded the lead TC level of 5 mg/l, having 6.0 mg/l lead in the test leachate.

Keyboards: No keyboards (0/3) failed the TCLP.

Mice: All mice tested (15/15) failed the TC for lead using the TCLP.

Laptops: 6 out of 6 laptops tested failed the TC using the TCLP.

Remote controls: All remotes (4 out of 4 tested) failed the TC for lead using the TCLP.

Smoke detectors: Most (8 out of nine 9 tested) failed the TC for lead using the TCLP.

Cell Phones: 28 out of 38 individual cell phones tested exceeded the TC for lead using the TCLP. The average lead in test leachate overall for cell phones was 20 mg/l. However, there was wide variability in the leach test results by brand and model, and the results ranged from zero to 65 mg/l lead in the test leachate.

Circuit boards: Many electronic devices fail the TC regulatory value for lead because lead is used in the printed wire boards (PWB), or circuit boards, which are part of these devices. In Jang and Townsend (2003), PWBs were leached using the TCLP, and lead exceeded the TC value, with an average of 162 mg/l. In Townsend (2004), PWBs tested with TCLP averaged 151 mg/l lead in the test leachate (3 samples).

References to studies cited:

Musson, S., Jang Y., Townsend, T., and Chung, I. "Characterization of Lead Leachability from Cathode Ray Tubes Using the Toxicity Characteristic Leaching Procedure" Environ. Sci. Technol. 2000, 34, 4376–4381.

Townsend, T., Vann, K., Mutha, S., Pearson, B., Jang, Y.,Musson, S., and Jordan, A. (2004). "RCRA Toxicity Characterization of Computer CPUs and Other Discarded Electronic Devices" July 15 2004. Funded by U.S. EPA Regions 4 & 5. Unpublished.

Jang , Y., and Townsend, T. (2003) "Leaching of Lead from Computer Printed Wire Boards and Cathode Ray Tubes by Municipal Solid Waste Landfill Leachates" Environ. Sci. Technol. 2003, 37, 4778–4784.

Townsend, T. (2003). "Leachability of Printed Wire Boards Containing Leaded and Lead-Free Solder". November 5, 2003. Funded by U.S. EPA/OPPTS. Unpublished.

Question 5. In October 2003, EPA proposed a rule that could deregulate up to 3 billion pounds of hazardous waste, including used circuit boards. Among other problems, EPA's proposed rule would allow hazardous wastes to be shipped on public roads without any tracking documents. Can you please tell me the status of this proposed rulemaking?

Response. This proposed rule would modify the definition of solid waste to promote increased recycling. EPA is currently evaluating the numerous and varied public comments received in response to our proposal. We are developing a broad range of options for the final rule, and we anticipate that EPA management will select preferred options by the end of this year. We currently expect to publish a final rule in November 2006. However, if the Agency believes it needs to re-propose all or parts of the proposal, we would expect to finalize that by the Winter of 2008. EPA would not support regulatory approaches that would allow unsafe management of hazardous wastes under the guise of recycling.

Question 6. EPA's "Plug-In to eCycling" program is a voluntary partnership to increase electronics recycling. The IG reported that several stakeholders involved with recycling electronics did not understand the purpose of this program or were not even aware of it. What steps is EPA taking to clearly define the program's goals and to increase awareness of the program?

Response. Electronics recycling is one of the key pillars of EPA's Resource Conservation Challenge (RCC)—a major initiative undertaken by EPA's Office of Solid Waste and Emergency Response as well as the Office of Pollution Prevention and Toxics to place more emphasis on toxics reduction and materials recovery. These two offices have developed an RCC Action Plan that addresses electronics.

Long before we developed the RCC Action Plan for electronics, EPA had clear goals with respect to our electronics programs and our electronics projects were designed to align with these goals. See page 14 of the IG's final report.

Despite the fact that numerous well-known retailers and manufacturers signed on as early supporters and participants of EPA's Plug-In to eCycling program (examples include Dell, Sony, Panasonic and Best Buy), purportedly, others that the IG spoke with were not aware of the program. Therefore, EPA has undertaken efforts to increase its communication of the Agency's electronics goals and programs.

In particular, EPA has worked hard to give greater visibility to the Plug-In goals. These goals are to:

- Work with partners to inform the public about the importance of electronics reuse and recycling and give them information about how to reuse or recycle their outgrown/unwanted electronics.
- Increase opportunities for Americans to safely recycle their electronics and to promote shared responsibility for safe electronics recycling by facilitating partnerships with communities, electronics manufacturers, and retailers.
- Establish pilot projects to test innovative approaches to safe electronics recycling.

Since the release of the IG report, EPA has done the following to give higher visibility to these goals:

(1) More visibly presented the program goals on the Plug-In website;

(2) Incorporated program goals, partners, and partner accomplishments into speeches by senior EPA officials, presentations at conferences, and materials and discussions at stakeholder meetings;

(3) Developed more public education materials that are disseminated at conferences, trade shows, and meetings. EPA partners also disseminate these materials at their recycling events, trade shows and meetings;

(4) Discussed the purpose of the Plug-In program and highlighted retailer-based Plug-In pilots in press advisories and shared the results of pilots through press releases and postings on EPA and partner websites;

(5) Highlighted the goals of Plug-In and partner accomplishments in media events at CES 2005;

(6) Highlighted the goals of Plug-In at the EPA National Electronics Meeting held in March 2005;

(7) Launched multi-stakeholder collaborative efforts aimed at increasing public awareness on how to donate outgrown computers and overcome hindrances to reuse like concerns regarding data security; and
(8) Required all partners to contribute to public outreach goals by completing education and outreach initiatives regarding electronics recycling.

Question 7. The EPA's IG recently concluded that the United States is "lagging behind international e-waste efforts." The IG highlighted laws in the European Union that require manufacturers to take financial responsibility for recycling their consumer electronic products and to reduce the use of six toxic chemicals in these products. Here in the United States, the Pollution Prevention Act establishes a national policy that "pollution should be prevented or reduced at the source whenever feasible."

Why hasn't the EPA used it authorities under the Pollution Prevention Act to require pollution prevention activities and manufacturer responsibility with electronic waste similar to the European Union's policies?

Response. The Pollution Prevention Act does not give EPA the authority to require pollution prevention activities or impose manufacturer responsibility. Under the Pollution Prevention Act, EPA is authorized to encourage voluntary approaches to pollution prevention. Voluntary measures we are undertaking to help support pollution prevention for electronics include the Electronic Product Environmental Assessment Tool (EPEAT), Federal Electronics Challenge, Plug-In to eCycling and the Design for the Environment program's work on lead-free solder.

It is true that the U.S. does not have Federal substance bans for electronics similar to those that will soon take effect in Europe. Most electronic products are manufactured for a worldwide market; thus manufacturers generally need to design their products to the most stringent design standards in effect wherever they are. According to many industry observers, many, if not most, electronics sold in the U.S. will meet the EU design requirements simply because most manufacturers will not be making a separate product for the U.S. market. California recently adopted substance bans essentially identical to those of the EU for selected electronic products. It is anticipated that these California requirements will capture any covered electronics that are made for a strictly U.S. market.

Question 8. EPA's EPEAT program seeks to develop criteria for judging electronics products that are designed to be environmentally friendly. The EPEAT program will allow manufacturers to self-select whether they meet all of the criteria to qualify for a bronze, silver of gold label.

Will EPA or a third party audit the representations made by manufacturers, or merely rely on data submitted by manufacturers?

Response. A credible verification process for product declarations is one of the most critical aspects for long-term EPEAT success. Purchasers and the environmental community must have confidence that the claims of manufacturers are accurate.

However, the stakeholders in the development of EPEAT, which include manufacturers, federal and state and local procurement officials, environmental organizations, recyclers, and others, agreed that, given the very short time-to-market characteristic of the electronic marketplace, it is impractical to use a third-party process to pre-verify each product claim before that claim can be used by the manufacturer. EPEAT therefore relies on manufacturer self-declaration that is backed up by a multi-tiered verification process.

The first tier in verification is the signing of a legal agreement with each manufacturer that wishes to declare products to the EPEAT standard. This must be signed by a high-level, responsible company manager, and will spell out, in an enforceable manner, the commitments of the company and the consequences of failing to meet those commitments.

Second, for each manufacturer, product self-declarations will be monitored to assure that they are being entered correctly. This is not a verification of accuracy, but declarations will be double checked by the EPEAT host organization. (The process of identifying a host organization for the EPEAT tool is now underway; it is expected that a host organization will be chosen later this year.) In product declarations, manufacturers are required to have ready for review specified data that supports the claim for each criterion.

Then on an annual basis, products will be selected for spot checks by the EPEAT host organization—a thorough verification of accuracy. Products will be randomly selected and, if questions or challenges have been raised by users of the system, specific products will be targeted. The number of spot checks will be variable, depending on the need to assure EPEAT credibility.

The process for administering and performing spot checks will use Qualified Verifiers, who have been properly trained and certified. The spot checks will include a review of the data that will be provided by the manufacturer, and will include product testing or other procedures as necessary. The spot check of factual findings will be brought to a Technical Verification Committee of independent, technical experts to pass judgment.

The EPEAT host organization will take any outstanding problems to the manufacturer to be explained or resolved. If a resolution cannot be achieved, termination of the declaration of the product in question will be undertaken. If multiple problems of this nature should occur, the manufacturer's ability to declare to EPEAT may be terminated. All these procedures will have been spelled out in the original agreement with the manufacturer.

RESPONSE BY THOMAS DUNNE TO AN ADDITIONAL QUESTION FROM SENATOR JEFFORDS

Question. There have been numerous reports about unsafe recycling of electronic waste in China, exposing children and workers to hazardous materials from computers that were exported from the U.S. Will EPA's upcoming rule on cathode ray tubes address this problem by either banning the export of electronic waste or requiring exporters to verify that electronic waste sent overseas to be recycled will be properly handled to protect against harm to human health and the environment? What is the status of this rulemaking and when is it expected to be published as a final rule?

Response. In response to our proposed rule, EPA received many comments about CRTs exported for recycling. We thoroughly evaluated all of these comments when developing our final rule, and examined all relevant options. The final rule, which is currently undergoing interagency review, will discuss the comments received and describe the final approach adopted, including responding to the comments that were submitted.

RESPONSE BY THOMAS DUNNE TO AN ADDITIONAL QUESTION FROM SENATOR LAUTENBERG

Question. As you know, CRTs may contain up to 10 lbs. or more of leaded glass. Are you planning to issue a "universal waste rule" for CRT glass to control this toxic metal? If not, why not?

Response. In June, 2002, EPA proposed an exclusion from the definition of solid waste for CRTs and CRT glass sent for recycling. The purpose of this rule is to encourage more reuse, recycling, and better management of this rapidly growing waste stream, while at the same time ensure that these materials are safely managed. The Agency believed that this regulatory exclusion was preferable to including CRTs in the universal waste rule because, in our view, these materials resemble commodities more than wastes when sent for reuse or recycling. Therefore, some of the requirements of the universal waste rule (e.g., notification and tracking) did not seem appropriate. However, we note that the management conditions of our proposed exclusion are very similar to the general conditions of the universal waste rule. Both sets of conditions would minimize the release of toxic constituents during storage and transport. With that said, the Agency did describe in the proposal and specifically requested comment on an alternative approach that would regulate CRT's and CRT glass sent for recycling under the universal waste rule, instead of excluding them from the definition of solid waste. The Agency received many comments on this "request for comment" which have been carefully evaluated and considered in the draft final rule, which is currently undergoing interagency review.

Finally, our proposed rule would not streamline RCRA requirements for CRTs that are hazardous and sent for disposal. Under the proposed rule, CRTs that are hazardous and sent to landfills or incinerators would still be subject to existing requirements, including use of the hazardous waste manifest.

STATEMENT OF JOHN B. STEPHENSON, DIRECTOR, NATURAL RESOURCES AND ENVIRONMENT

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to discuss our work to date on the issues surrounding the growing volume of used electronics accumulating in the nation's basements, attics, and landfills. Rapid advancements in technology have led to increas-

ing sales of new electronic devices, particularly televisions, computers, and computer monitors. Approximately 62 percent of U.S. households had computers in 2003, compared with only 37 percent just 6 years earlier. With this increase comes the dilemma of how to manage these products when they come to the end of their useful lives. The Environmental Protection Agency (EPA) has estimated that in 2003 alone, about 50 million existing computers became obsolete, but one estimate forecast that less than 6 million were recycled.

Disposal of used electronics creates potential problems that can be averted through recycling or reuse. For example, concerns have been raised because toxic substances such as lead, which have well-documented adverse health effects, can potentially leach from used electronics. Concerns have also been raised over used electronics that are exported from the United States to countries with less stringent environmental regulations. In addition, computers contain precious metals, such as gold, silver, and platinum, that require substantial amounts of energy and land to extract. These metals can often be extracted with less environmental impact from used electronics than from the environment. The U.S. Geological Survey, for instance, reports that 1 metric ton of computer scrap contains more gold than 17 tons of ore and much lower levels of harmful elements common to ores, such as arsenic, mercury, and sulfur.

In this context, you and several other Members of the Congress asked. that we address, a number of issues surrounding this problem. Specifically, we were asked to (1) summarize existing information on the volumes of, and problems associated with, used electronics and (2) examine the factors. affecting the nation's ability to recycle and reuse electronics when such products have reached the end of their useful lives.

To address these issues, we are examining studies that provide nationwide estimates on the amount of used electronics,[1] as well as federal and state government studies (including those by EPA and task forces in Oregon and Washington), industry and interest group studies, and local studies (including municipal solid waste characterization studies) that discuss the problems associated with used electronics. We are also visiting states and localities that have implemented programs or passed legislation to responsibly manage used electronics, including California, Maine, Maryland, Massachusetts, Oregon, and Washington. In addition, we are surveying participants in the National Electronics Product Stewardship Initiative and other key stakeholders, which include key stakeholders from Federal, State, and local governments, environmental organizations, recyclers, retailers, equipment manufacturers, and academicians. To date, we have received responses from 41 of the 53 survey participants. We are also comparing current government and industry practices with existing practices for promoting recycling in other industries, such as bottle- and can-recycling programs and the Rechargeable Battery Recycling Corporation program. Further, we are examining EPA-sponsored Federal, State, and local pilot programs that attempt to encourage recycling of electronic products. Our work is being done in accordance with generally accepted government auditing standards, which include an assessment of data reliability and internal controls.

We are here to present our preliminary observations on these issues. We will report the final results of our study and any recommendations we may develop at a later date. In summary:

• Available estimates suggest that the volume of used electronics is large and growing and that if improperly managed can harm the environment and human health. While data and research are limited, some data suggest that over 100 million computers, monitors, and televisions become obsolete each year and that this amount is growing. These obsolete products can be either recycled, reused, disposed of in landfills, or stored by users in places such as basements, garages, and company warehouses. Available data suggest that most used electronics are probably stored. These units have the potential to be recycled and reused, disposed of in landfills, or exported for recycling and reuse overseas. If ultimately disposed in landfills, either in the United States or overseas, valuable resources, such as copper, gold, and aluminum, are lost for future use. Additionally, standard regulatory tests show that some toxic substances with known adverse health effects, such as lead, have the potential to leach into landfills. Although one study suggests that leaching is not a concern in modern U.S. landfills, it appears that many of these products end up in countries without modern landfills or the environmental regulations comparable to the United States.

• Both economic and regulatory factors discourage recycling and reuse of used electronics:

[1] For the purposes of our study, used electronics includes computers, computer monitors, and televisions that have reached the end of their original useful life.

• Economic factors inhibit the recycling and reuse of used electronics. Consumers generally have to pay fees and drop off their used electronics at often inconvenient locations to have them recycled or refurbished for reuse. Consumers in Snohomish County, WA, for instance, may have to travel more than an hour to the nearest drop-off location, which then charges between $10 and $27 per unit depending on the type and size of the product. Consumers in the Portland, OR area, pay one local recycler 50 cents per pound to have their used computers recycled, which is about $28 for an average-sized desktop computer. Recyclers and refurbishers charge these fees because costs associated with recycling and refurbishing outweigh the revenue received from recycled commodities or refurbished units. This point was underscored by the International Association of Electronics Recyclers, which reported that the value of commodities recovered from computer equipment (such as shredded plastic, copper, and aluminum) is only between $1.50 and $2.00 per unit. It was further underscored by our interviews with eight electronics recyclers, who were unanimous in emphasizing that they could not cover costs without charging fees.

• Federal regulatory requirements provide little incentive for environmentally preferable management of used electronics. The governing statute, the Resource Conservation and Recovery Act, bars entities that dispose of more than 220 pounds of hazardous waste per month from depositing hazardous waste (including some used electronics) in landfills. However, RCRA does not prohibit households and entities that generate less than 220 pounds of hazardous waste per month from sending hazardous waste to municipal landfills. Consequently, since only four states currently ban disposal of used electronics in their trash or local landfill, most consumers in the remaining 46 states (and the District of Columbia) are allowed to do so-and have little incentive to do otherwise. Not surprisingly, available data suggest that states and localities that do not have landfill bans have dramatically lower levels of recycling than the four states that have enacted landfill bans. In addition, federal regulations provide for neither a financing system for responsible management of used electronics, nor oversight of these products when exported—a particular problem in the case of some developing countries, where risks to the environment and human health may be more likely because of less stringent environmental regulations.

In the absence of a national approach, a patchwork of potentially conflicting state requirements is developing. This patchwork may be placing a substantial burden on recyclers, refurbishers, and other stakeholders. As we conclude our work, we will be examining the implications of our findings for the ongoing efforts among the states to deal with the problem, for the various legislative solutions that have been proposed to create a uniform national approach, and for options the federal government can pursue to encourage recycling and reuse of used electronics.

BACKGROUND

Few people are aware of recycling options for their old televisions and personal computers. Because of the perceived value of used electronics, some pass their used equipment to family members or friends before eventually storing these units in their attics, basements, or garages. Eventually, though, consumers need to dispose of these units in some manner. By choosing to have these products recycled, consumers ensure the recovery of resources like copper, iron, aluminum, and gold, which would otherwise be procured through less environmentally friendly practices such as mining. Likewise, consumers who choose to recycle also reduce the amount of waste entering the nation's landfills and incinerators. Since used electronics typically contain toxic substances like lead, mercury, and cadmium, recycling or refurbishing will prevent or delay such toxic substances from entering landfills.

The Congress affirmed its commitment to reducing waste and encouraging recycling, first through enactment of the Resource Conservation and Recovery Act (RCRA) of 1976, and then again with passage of the Pollution Prevention Act of 1990. Both RCRA and the Pollution Prevention Act address alternatives to waste disposal. RCRA promotes the use of resource recovery, either through facilities that convert waste to energy or through recycling. To promote recycling, RCRA required EPA to develop guidelines for identifying products that are or can be produced with recovered materials. RCRA also requires federal agencies to procure items that are, to the maximum extent practicable, produced with recovered materials. The Pollution Prevention Act provides that pollution that cannot be prevented should be recycled or treated in a safe manner, and disposal or other releases should be used only as a last resort. It specified that pollution prevention can include such practices as modifying equipment, technology, and processes; redesigning products; and substituting less-toxic raw materials. Executive Order 13101, issued on September 14,

1998, also affirmed the federal government's commitment to encourage recycling by directing federal agencies to consider procuring products that, among other things, use recovered materials, can be reused, facilitate recycling, and include fewer toxic substances.

Nonetheless, while large-quantity generators, such as businesses, schools, and government agencies, must treat some used electronics as hazardous waste due to the relatively high level of toxic substances, it is not illegal for households or for small quantity generators—non-household entities disposing of less than 220 pounds per month—to dispose of used electronics in landfills in most states. Under RCRA, household hazardous wastes, including used electronics, may be disposed of at municipal solid waste landfills. However, some states have begun imposing more stringent disposal requirements for used electronics. For example, because of concerns regarding the potential environmental and health effects of leaded glass in cathode ray tubes (CRTs), California, Maine, Massachusetts, and Minnesota recently banned them from disposal in municipal landfills.

As national awareness of potential problems associated with the disposal of used electronics has grown, EPA has taken steps to encourage recycling of used electronics. For instance, EPA, together with electronics manufacturers, retailers, and recyclers, sponsored several pilot programs in 2004 to measure the success of convenient collection options for used electronics. Other recent EPA efforts, such as the Federal Electronics Challenge and the Electronic Product Environmental Assessment Tool (EPEAT) program, attempt to leverage U.S. Government procurement power to drive environmentally preferable design for electronic products. Finally, through the establishment of the National Electronic Product Stewardship Initiative (NEPSI) in 2001, EPA established a voluntary, multi-stakeholder initiative to reach consensus on a national approach to encourage recycling of used electronics. This voluntary effort ultimately dissolved in 2005 without agreement, however, because stakeholders could not reach consensus on a nationwide financing system.

VOLUME OF USED ELECTRONICS AND THE PROBLEMS THEY POSE

The information we have reviewed to date suggests strongly that the volume of used electronics is large and growing. For example, in a 1999 study, the National Safety Council forecast that almost 100 million computers and monitors would become obsolete in 2003-a three-fold increase over the 33 million obsolete computers and monitors in 1997.[2] Additionally, a 2003 International Association of Electronics Recyclers report estimated that 20 million televisions become obsolete each year—a number that is expected to increase as CRT technology is replaced by new technologies such as plasma screens.[3]

Thus far, it appears that relatively few units have found their way into either landfills or recycling centers. Available EPA data indicate that less than 4 million monitors and 8 million televisions are disposed of annually in U.S. landfills-only a fraction of the amount estimated to become obsolete annually, according to EPA. Additionally, the 1999 National Safety Council report forecast that only 19 million computers, monitors, and televisions would be recycled in 2005. Hence, the gap between the enormous quantity of units that are obsolete (or becoming obsolete), and the quantity either in landfills or sent to recycling centers, suggests that most used electronics are still in storage-such as attics, basements, and garages-and that their ultimate fate is still not certain, or have been exported for recycling and reuse overseas.

Conventional disposal of used electronics in landfills raises two primary concerns, according to research we reviewed: the loss of natural resources and the potential release of toxic substances in the environment. By disposing of these products in landfills or incinerators, valuable resources are lost for future use. For example, computers typically contain precious metals, such as gold, silver, palladium, and platinum, as well as other useful metals like aluminum and copper. Further, the U.S. Geological Survey reports that one metric ton of computer circuit boards contains between 40 and 800 times the concentration of gold contained in gold ore and 30 to 40 times the concentration of copper, while containing much lower levels of

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[2] National Safety Council, *Electronic Product Recovery and Recycling Baseline Report* May 1999. These estimates are based on major assumptions, as well as responses from only 38 percent of sampled companies. Although, the study supports the existence of a large and growing problem, the precise estimates should be used with caution.

[3] International Association of Electronics Recyclers, *IAER Electronics Recycling Industry Report* 2003. These estimates are based on major assumptions, as well as responses from only 20 percent of sampled companies. Although the study supports the existence of a large and growing problem, the precise estimates should be used with caution.

harmful elements common to ores, such as arsenic, mercury, and sulfur.[4] The research we have thus far reviewed also suggests that the energy saved by recycling and reusing used electronics is significant-the author of one report by the United Nations University states that perhaps as much as 80 percent of the energy used in a computer's life can be saved through reuse instead of producing a new unit from raw materials.[5]

Regarding the issue of toxicity, the research we have reviewed to date is unclear on the extent to which toxic substances may leach from used electronics in landfills. On one hand, according to a standard regulatory test RCRA requires to determine whether a solid waste is hazardous and subject to federal regulation, lead (a substance with known adverse health affects) leaches from some used electronics under laboratory conditions. Tests conducted at the University of Florida indicate that lead leachate from computer monitors and televisions with cathode ray tubes exceeds the regulatory limit and, as a result, could be considered hazardous waste under RCRA.[6] On the other hand, the study's author told us that these findings are not necessarily predictive of what could occur in a modern landfill. Furthermore, a report by the Solid Waste Association of North America suggests that while the amount of lead from used electronics appears to be increasing in municipal solid waste landfills, these landfills provide safe management of used electronics without exceeding toxicity limits that have been established to protect human health and the environment.[7]

ECONOMIC AND REGULATORY FACTORS DETER RECYCLING AND REUSE OF USED ELECTRONICS

The costs associated with recycling and reuse, along with limited regulatory requirements or incentives, discourage environmentally preferable management of used electronics. Generally, consumers have to pay fees and take their used electronics to often inconvenient locations to have them recycled or refurbished for reuse. Recyclers and refurbishers charge fees to cover the costs of their operations. In most states, consumers have an easier and cheaper alternative—they can take them to the local landfill. These easy and inexpensive alternatives help explain why so little recycling of used electronics has thus far taken place in the United States. This economic reality, together with federal regulations that do little to preclude disposal of used electronics along with other wastes, have led a growing number of states to enact their own laws to encourage environmentally preferable management of these products.

Cost and Consumer Inconvenience Discourage Recycling and Reuse of Used Electronics

Consumers who seek to recycle or donate their used electronics for reuse generally pay a fee and face inconvenient drop-off locations. Unlike their efforts for other solid waste management and recycling programs, most local governments do not provide curbside collection for recycling of used electronics because it is too expensive. Instead, some localities offer used electronics collection services, for a fee, at local waste transfer stations. These localities send consumers' used electronics to recyclers for processing. For example, transfer stations in Snohomish County, WA, charge consumers between $10 and $27 per unit for collecting used electronics and transporting them to recyclers. Moreover, such transfer stations are generally not conveniently located, and rural residents, such as those in Snohomish County, may need to drive more than an hour to get to the nearest drop-off station.[8] In some localities, consumers can also take their used electronics directly to a recycler, where they are typically charged a fee. In the Portland, OR area, for instance, one recycler charges consumers 50 cents per pound to recycle computers, monitors, and tele-

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[4] Bleiwas, Donald and Kelly, Thomas, Obsolete Computers, "Gold Mines,"or High-Tech Trash? Resource Recovery From Recycling (Washington, DC: U.S. Geological Survey, 2001). Because we have not yet reviewed this study, this data should be used with caution.

[5] The United Nations University is a think tank for the United Nations and is not a degree granting university.

[6] Townsend, Timothy, et al, Characterization of Lead Leachability from Cathode Ray Tubes Using the Toxicity Characteristic Leaching Procedure. (University of Florida, Department of Environmental Engineering Sciences: 2000). Because we have not yet reviewed this study, these estimates should be used with caution.

[7] Solid Waste Association of North America, The Effectiveness of Municipal Solid Waste Landfills in Controlling Releases of Heavy Metals to the Environment (2004). Because we have not yet reviewed this study, this data should be used with caution.

[8] Over 70 percent of the survey respondents felt that existing collection options for recycling used electronics were inconvenient for households.

visions, which means it costs the consumer about $28 to recycle an average-sized desktop computer system.

Recyclers charge these fees to cover the costs they incur when disassembling used electronics, processing the components, and refining the commodities for resale. As noted in a 2003 report by the International Association of Electronics Recyclers, most recyclers and refurbishers in the United States cannot recoup their expenses from the resale of recycled commodities or refurbished units. The report, which compiled data from more than 60 recyclers in North America, stated that the costs associated with recycling are greater than the revenue received from reselling recycled commodities, and that fees are needed to cover the difference. Furthermore, the report states that the value of commodities recovered from computer equipment, such as shredded plastic, copper, and aluminum, is only between $1.50 and $2.00 per unit.[9]

The costs associated with recycling make it unprofitable (without charging fees) for several reasons. First, recycling used electronics is labor intensive-the equipment must be separated into its component parts, including the plastic housing, copper wires, metals (e.g., gold, silver, and aluminum), and circuit boards, as well as parts that can be easily reused or resold, like hard drives and CD-ROM drives. Officials with Noranda Recycling Inc., which recycles used electronics for Hewlett-Packard, told us that over 50 percent of their total costs for recycling are labor costs involved in disassembly, even though they operate some of the most technologically advanced equipment available. Labor costs are high, in part, because electronic products are not always designed to facilitate recycling at their end of life. For instance, a Hewlett-Packard official told us 30 different screws must be removed to take out one lithium battery when disassembling a Hewlett-Packard computer for recycling. According to this official, if Hewlett-Packard spent $1 in added design costs to reduce the number of different screws in each computer, it would save Noranda approximately $4 in its disassembly costs.

Second, to obtain sellable commodities, the resulting metal and plastic "scrap" must be further processed to obtain shredded plastic, aluminum, copper, gold, and other recyclable materials. Processing in this fashion typically involves multimillion-dollar machinery. According to officials with one international electronics recycling company, processing costs are high, in part, because this sophisticated machinery is being used to process the relatively limited supply of used electronics being recycled in the United States. The firm's officials noted that in Europe, by contrast, where manufacturers are required to take financial responsibility for the disposal of their products, the increased supply of recyclable electronics has decreased the firm's per-unit processing costs and increased the profitability of recycling used electronics.

Finally, recyclers incur additional expenses when handling and disposing of toxic components (such as batteries) and toxic constituents (such as lead), which are all commonly found in used electronics. These expenses include removing the toxic components and constituents from the product, as well as handling and processing them as hazardous material. Once separated from the product, these wastes are considered hazardous wastes and are subject to more stringent RCRA requirements governing their transportation, storage, and disposal. CRTs from computer monitors and televisions are particularly expensive to dispose of because they contain large volumes of leaded glass, which must be handled and disposed of as a hazardous waste. Since CRT manufacturing is declining in the United States, some recyclers send their CRT glass to a lead smelter in Missouri that charges recyclers for their CRT glass. A study on the economics of recycling personal computers found that the cost associated with disposing of CRT monitors substantially reduces a recycler's net revenue.[10]

Refurbishers charge similar fees to cover the costs involved in guaranteeing data security by "wiping" hard drives, upgrading systems, installing software, and testing equipment. A program manager for a nonprofit technology assistance provider told us that it generally costs about $100 to refurbish a Pentium III computer system, plus an additional licensing fee of about $80 for an operating system.

To encourage used electronics recycling, EPA sponsored pilot programs that addressed the cost and inconvenience issues. Office Depot and Hewlett-Packard, for example, partnered to provide free take-back of used electronics at Office Depot retail stores. Collected used electronics were sent to Hewlett-Packard facilities for recy-

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[9] This point is further underscored by our interviews with 8 electronics recyclers, who were unanimous in emphasizing that they could not cover costs without charging fees.

[10] Boon, J.E., Isaacs, J.A., and Gupta, S.M. "Economic Sensitivity for End of Life Planning and Processing of Personal Computers." Journal of Electronics Manufacturing (Vol. 11, 81–93, 2002). Because we have not yet reviewed this study, this data should be used with caution.

cling. Over a 3-month period, nearly 215,000 computers, monitors, and televisions were collected and recycled. EPA officials told us that the pilot program showed the extent to which recycling can be encouraged by making it inexpensive and convenient to the consumer.

Federal Regulatory Framework Governing Used Electronics Provides Little Incentive for Recycling or Reuse

The lack of economic incentives promoting recycling and reuse of electronics is compounded by the absence of federal provisions that either encourage recycling, or preclude their disposal in landfills. Specifically, current federal laws and regulations (1) allow hazardous used electronics in municipal landfills, (2) do not provide for a financing system to support recycling, and (3) do little to preclude electronic products generated in the United States from being exported and subsequently threatening human health and the environment overseas. While several promising federal initiatives supporting electronics recycling have been launched, their voluntary nature makes their success uncertain.

Hazardous Used Electronics Are Allowed in Municipal Landfills

Regulation of used electronics at the federal level falls under RCRA Subtitle C, which was established to ensure that hazardous waste is managed in a manner that is protective of human health and the environment. However, households and small quantity generators are exempt from many RCRA regulations, thus allowing them to deposit their used electronics in municipal solid waste landfills—even though cathode ray tubes in computer monitors and televisions, and potentially circuit boards in computers, exhibit characteristics of hazardous waste. EPA's Office of Solid Waste regulates hazardous waste under RCRA, but it lacks the authority to require environmentally preferable management of used electronics through recycling and reuse or to establish a mandatory national approach, such as a disposal ban. As a result, all of the office's efforts with regard to the recycling of used electronics are voluntary.

In response to RCRA's exemption for household hazardous waste and the growing volume of obsolete electronics within their boundaries, four states-California, Maine, Massachusetts, and Minnesota-recently banned from landfills some used electronics.[11] Our preliminary work suggests that such bans have contributed to a higher degree of recycling than in states where disposal in solid waste landfills is allowed. In San Ramon, CA, for instance, a 1-day collection event for television monitors yielded 24,000 units. In contrast, in Richmond, Virginia, a metropolitan area 4 times the size of San Ramon but without a landfill ban, a similar collection event (organized by the same electronics recycler as in San Ramon) only yielded about 6,000 monitors. This difference in yield is consistent with assessments of California and Massachusetts officials, who all told us that their states have seen substantial increases in used electronics recycling. One international electronics recycler, for instance, set up recycling facilities in the San Francisco area in 2003 because of the large volume of used electronics that were no longer being disposed of in landfills. In Massachusetts, an official with the Department of Environmental Protection told us that six businesses dedicated to electronics recycling were created following the enactment of a landfill ban. Finally, about 75 percent of the survey respondents to date said that a national disposal ban should be enacted to overcome the economic and regulatory factors that discourage recycling and reuse of used electronics.

Experts Believe a National Financing System is Needed to Support Recycling

Given the inherent economic disincentives to recycle used electronics, we found widespread agreement among our survey respondents and others we contacted that the establishment of some type of financing system is critical to making recycling and reuse sufficiently inexpensive and convenient to attract the participation of consumers. For instance, almost 90 percent of survey respondents believe that either an advanced recycling fee (ARF), extended producer responsibility (EPR), or a hybrid of the two should be implemented if national solution is instituted. Yet despite broad agreement in principle, participants in the recent multi-stakeholder NEPSI process, particularly those in the computer and television industries, did not reach agreement on a uniform, nationwide financing system after several years of meetings.

In the absence of a national system, several states have enacted their own financing systems through legislation to help ensure environmentally preferable management of used electronics. For example, in 2005, California implemented an ARF on all new video display devices, such as televisions and computer monitors, sold with-

[11] The landfill bans in Maine and Minnesota take full effect in 2006.

in the state. The fee is charged to consumers at the time and location of purchase, and can range between $6 and $10. According to an official with the California Department of Toxic Substance Control, the revenues generated from the fee are intended to deal with a key concern—used electronics in storage, or "legacy waste." The officials explained that while California's recycling industry for used electronics had sufficient capacity to recycle large volumes, consumers and large-quantity generators had little incentive to take products out of their basements or warehouses to have them recycled. The state uses revenues from the fees to reimburse electronics recyclers at the rate of 48 cents per pound of used electronics recycled. The recyclers, in turn, pass on 20 cents per pound to collectors of used electronics, thereby providing an incentive for entities to make collection free and convenient for households.

The state is still in the preliminary stages of program implementation, and state officials acknowledge that they face a number of challenges. Some of these challenges underscore the difficulty of dealing with the electronic waste problem on a state-by-state basis. The officials noted, for instance, that the ARF applies only to electronics purchased in California, and that the fees are intended only for used electronics originating in the state. Implementing the program within the state's boundary, however, may prove difficult because the payout for used electronics may attract units originating in other states. Preventing this problem, they say, requires substantial documentation for each unit, and may require a substantial enforcement effort.

While California's ARF focuses on consumers of electronics, Maine's approach focuses on producers. In 2004, the state passed legislation requiring computer and television manufacturers who sell products in Maine to pay for the take back and recycling of their products at their end of life-a strategy referred to as EPR. Under this plan, consumers are to take their used electronics to a consolidation point, such as a transfer station, where they are sorted by original manufacturer. Each manufacturer is responsible for transporting and recycling its products, along with a share of the products whose original manufacturer no longer exists. According to one official with Maine's State Planning Office, a key challenge of its EPR system is the lack of a financial incentive for consumers to take their used electronics out of storage: they must still take their products to a consolidation point, and will still likely have to pay a fee.

Several other states, as well as some countries, have implemented or are considering implementing financing systems for used electronics. Earlier this year, Maryland passed legislation requiring all computer manufacturers that sell computers in the state to pay $5,000 into a fund to help implement local recycling programs.[12] Other states, such as Arkansas, Colorado, Florida, and Massachusetts have allocated grants to help pay for the recycling of used electronics, and New York, Rhode Island, and Vermont are considering enacting manufacturer take-back programs. In Europe, the European Union implemented the Waste Electrical and Electronic Equipment Management Regulations in July 2004, which requires producers of electronic products to be financially responsible for the recycling or reuse of their products at end of life. In our final report, we will provide a more complete examination of various strategies for financing environmentally preferable management of used electronics.

Oversight of Exhorted Used Electronics Is Limited

The lack of oversight over exports of used electronics could also discourage environmentally preferable management of used electronics. In the United States, businesses, schools, government agencies, and other organizations, as well as households, face multiple options for their used electronics. In some instances, organizations and recyclers receive e-mails from brokers, who typically have partners in Asia, willing to pay them for their used electronics, regardless of whether they can be reused. For example, one broker requests up to 50,000 used monitors per month and does not require the monitors to be tested. Another broker specifically requests nonworking monitors and wanted to fill at least 10 containers, which equals anywhere from 6,000 to 11,000 units, depending on their size. One Seattle area recycler said that brokers such as these are probably not handling the units in environmentally preferable ways once the units are exported. Even so, one business we contacted said it regularly receives e-mail requests such as these.

Companies export used electronics because the largest markets for reused computers and computer parts are overseas, according to an EPA official. Likewise, de-

[12] An official with the Maryland Department of Environment estimated that anywhere from 40 to 200 computer manufacturers might be required to pay the fee. He cited one estimate that the fee will provide the state with about $400,000 to use toward recycling used electronics.

mand is high for recycled commodities, which can be processed more cheaply due, in part, to lower, wages and less stringent environmental requirements. Also, unlike their counterparts in some other developed countries, the U.S. officials have permitted the export of hazardous used electronics, such as CRT monitors and televisions, if the exporter asserts that the equipment is destined for reuse. While some environmental groups have called for a ban on exports of used electronics, the Congressional Research Service noted that such a ban would cut recyclers off from many of the markets able to reuse the materials.[13]

However, few safeguards are in place to ensure that exported used electronics are indeed destined for reuse.[14] Used electronics that are destined for reuse are not considered to be waste subject to RCRA export regulations. Instead, such electronics are considered to be commodities, which means that they can be exported with little or no documentation, notification, and oversight. Nonetheless, instances have been recently documented in which environmental and human health threats have resulted from the less-regulated disassembly and disposal of United States-generated used electronics overseas. For example, a 2002 documentary by the Basel Action Network and Silicon Valley Toxics Coalition videotaped egregious disassembly practices in China that involved open burning of wire to recover copper, open acid baths for separating precious metals, and human exposure to lead and other hazardous materials.[15] Without the ability to track the exported units to importing countries, or to audit companies exporting used electronics, it is difficult to verify that exported used electronics are actually destined for reuse, or that they are ultimately managed responsibly once they leave U.S. shores. As our work continues, we will further examine the extent of the problems associated with irresponsible management of used electronics overseas.

Opportunities Exist for Federal Initiatives to Enhance Electronics Recycling

The federal government has taken some steps to affirm its commitment to encourage recycling of used electronics through the implementation of two voluntary programs sponsored by EPA. The Federal Electronics Challenge (FEC) and the Electronic Product Environmental Assessment Tool (EPEAT) both leverage U.S. Government purchasing power to promote environmentally preferable management of electronic products from procurement through end of life. For example:

- The FEC program challenges federal agencies and facilities to procure environmentally preferable electronic products, extend the lifespan of these products, and, expand markets for recycling and recovered materials by recycling them at their end of life. The FEC provides guidance on environmentally preferable attributes of electronic products information, on operating and maintaining them in an energy-efficient manner, and on options for recycling or reusing them at the end of their useful lives. To date, 11 federal agencies and 26 individual federal facilities participate in the FEC to some extent. The Bonneville Power Administration (BPA) recently documented cost savings associated with its FEC participation. BPA noted, for example, that the program extended the lifespan of its personal computers from 3 to 4 years. With over 500 computers procured each year at an annual cost of more than $500,000, a BPA official told us extending computer life spans could generate substantial savings. Additionally, BPA decided to procure new flat-screen monitors instead of CRT monitors, reducing both hazardous waste tonnage and end of life recycling costs. According to BPA, it expects to save at least $153 per monitor over each monitor's life.
- The EPEAT program promotes environmentally preferable management of electronics by allowing large purchasers, such as government agencies, to compare and select laptop computers, desktop computers, and monitors with environmentally preferable attributes. For example, EPEAT evaluates an electronic product's design for energy conservation, reduced toxicity, extended lifespan, and end of life recycling, among other things. EPEAT's three-tier system—bronze, silver, and gold—provides purchasers with the flexibility to select equipment that meets the minimum performance criteria, or to give preference to products with more environmental attributes. For manufacturers, EPEAT provides flexibility to choose which optional criteria they would like to meet to achieve higher levels of EPEAT quali-

[13] Congressional Research Service, Recycling Computers and Electronic Equipment: Legislative and Regulatory Approaches for "E–Waste," (Washington, D.C.: 2003).

[14] The following are generally not classified as solid wastes under RCRA: Used electronics for reuse, whole circuit boards, shredded circuit boards, if free of certain hazardous materials, metal from used electronics, and scrap metal.

[15] The Basel Action Network is an environmental group that works to prevent the trade of toxic wastes from developed countries to developing countries. The Silicon Valley Toxics Coalition is an environmental group that works to prevent environmental and human health problems caused by the electronics industry.

fication. EPA expects EPEAT to be instituted in 2006, and products with higher environmental ratings could receive preferred consideration in federal procurement decisions.

While we will continue to examine the FEC and EPEAT programs in greater detail, including how stakeholders say they might be improved, our preliminary work suggests that the federal government can build on these initiatives by using its purchasing power to lead markets for electronic products in environmentally friendly directions. In fact, there is ample precedent for such a strategy, perhaps most notably in EPA's and the Department of Energy's Energy Star program. In that program, the federal government partners with industry to offer businesses and consumers energy-efficient products that ultimately save money and protect the environment. According to EPA, in 2004 alone, Energy Star products helped save approximately $10 billion in energy costs and reduced greenhouse gas emissions by an amount equivalent to that produced by 20 million automobiles. Part of Energy Star's success can be attributed to federal actions, particularly those outlined in two executive orders that required federal agencies to purchase products equipped with Energy Star features. Since the federal government will spend over $60 billion on information technology products in fiscal year 2005, including televisions, computers, and computer monitors, it could go beyond the voluntary and limited FEC and EPEAT programs by broadening the programs' scope and requiring agency participation in, or adherence to, some of the programs' key practices. As with the Energy Star program, such actions may lead to cost savings and greater environmental protection. Of particular note, over 80 percent of the survey respondents to date said that Federal Government procurement criteria along the lines of FEC and EPEAT should be required, and about 95 percent of the survey respondents to date said that such procurement criteria would encourage environmentally preferable product design, as well as recycling and reuse.

OBSERVATIONS ON FEDERAL ACTIONS TO ENCOURAGE RECYCLING AND REUSE OF USED ELECTRONICS

In our future work, we will continue to examine factors affecting recycling in greater detail, and the diverse efforts by individual states and others to deal with these issues. It is becoming clear, though, that in the absence of a national approach, a patchwork of potentially conflicting state requirements is developing, and that this patchwork may be placing a substantial burden on recyclers, refurbishers, and other stakeholders. A manufacturer in one state, for example, may have an advance recovery fee placed on its products, whereas in another state, the same manufacturer may have to take back its products and pay for recycling. Further, a retailer may have to set up a system in one state to collect fees on specific products and, at the same time, set up a different system in another state to take back a particular manufacturer's product. Hence, manufacturers we contacted said that while they had their preferences regarding, for instance, an ARF or EPR system, their main preference is to operate within a uniform national system that mandates a financing mechanism that preempts varying state requirements. Our preliminary survey results substantiate these views, with over 90 percent of survey respondents indicating that national legislation should be enacted and, if so, almost 90 percent believe a financing mechanism should be included.

Our future work will also discuss some of the options—both legislative and administrative—being considered to encourage environmentally preferable management of used electronics at a national level. Frequently cited options include disposal bans, consumer education programs, a variety of financing systems, export restrictions, and federal government procurement requirements. These options may offer suggestions for a uniform national approach and what aspects should be considered. Additionally, an examination of EPA's voluntary programs—the FEC and EPEAT—may shed light on other, more effective options available to the federal government that can save money over electronic products' life cycle; enhance environmental protection; drive markets for environmentally preferable product design; and establish a recycling infrastructure and markets for recycled commodities.

Finally, with rapid advances in technology, particularly in consumer electronics, new products are reaching.the marketplace with remarkable speed. Consequently, our future work will also examine the implications of these newer generations of electronics entering the nation's waste stream.

Mr. Chairman, this completes my prepared statement. I would be happy to respond to any questions you or other Members of this Subcommittee may have at this time.

GAO
Accountability · Integrity · Reliability

Highlights

Highlights of GAO-05-937T, a testimony before the Subcommittee on Superfund and Waste Management, Committee on Environment and Public Works, United States Senate

July 26, 2005

ELECTRONIC WASTE

Observations on the Role of the Federal Government in Encouraging Recycling and Reuse

Why GAO Did This Study

Advances in technology have led to rapidly increasing sales of new electronic devices, particularly televisions, computers, and computer monitors. With this increase comes the dilemma of how to manage these products when they come to the end of their useful lives. Concerns have been increasingly expressed that while millions of existing computers become obsolete each year, only a fraction of them are being recycled.

Some have alleged that the disposal of used electronics causes a number of environmental problems. They note, for example, that toxic substances such as lead can leach from used electronics. They have also noted that computers and other electronic equipment contain precious metals that require substantial amounts of energy and land to extract. These metals, they say, can often be extracted with less environmental impact from used electronics than from the environment.

In this testimony, GAO summarizes existing information on the amounts of, and problems associated with, used electronics. GAO also examines the factors affecting the nation's ability to recycle and reuse electronics when such products have reached the end of their useful lives.

This testimony discusses preliminary results of GAO's work. GAO will report in full at a later date.

www.gao.gov/cgi-bin/getrpt?GAO-05-937T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact John Stephenson at (202) 512-3841 or Stephensonj@gao.gov.

What GAO Found

Available estimates suggest that the amount of used electronics is large and growing, and that if improperly managed can harm the environment and human health. While data and research are limited, some data suggest that over 100 million computers, monitors, and televisions become obsolete each year, and that this amount is growing. These obsolete products are either recycled, reused, disposed of in landfills, or stored by users in places such as basements, garages, and company warehouses. Available data suggest that most used electronics are probably stored. The units still in storage have the potential to be recycled and reused, or disposed in landfills; or, they may be exported for recycling or reuse overseas. If disposed of in landfills, valuable resources, such as copper, gold, and aluminum, are lost for future use. Additionally, standard regulatory tests show that some toxic substances with known adverse health effects, such as lead, have the potential to leach from discarded electronics into landfills. Although one study suggests that this leaching does not occur in modern U.S. landfills, it appears that many used electronics end up in countries without either modern landfills or with considerably less protective environmental regulations.

Economic factors, such as cost, inhibit the recycling and reuse of used electronics. Consumers generally have to pay fees and drop off their used electronics at often inconvenient locations to have their used electronics recycled or refurbished for reuse. Consumers in Snohomish County, Washington, for instance, may have to travel more than an hour to the nearest drop-off location, which then charges between $10 and $27 per unit, depending on the type and size of the product. Recyclers and refurbishers charge these fees because costs associated with their processes outweigh the revenue received from recycled commodities or refurbished units. In addition to the challenges posed by these economic factors, federal regulatory requirements provide little incentive for environmentally preferable management of used electronics. The governing statute, the Resource Conservation and Recovery Act, regulates the disposal practices of large generators of hazardous waste (including electronic waste) but exempts individuals and households from these requirements.

In the absence of a national framework for dealing with the problem, a patchwork of potentially conflicting state requirements appears to be emerging. Manufacturers in one state, for instance, may have an advance recovery fee placed on their products, but the same manufacturers may have to take back their products and pay for recycling in another. This patchwork may be placing a substantial burden on recyclers, refurbishers, and other stakeholders. As GAO concludes its work, it will examine the implications of these findings for the ongoing efforts among the states to deal with this growing problem, for the various legislative solutions that have been proposed to create a uniform national approach, and for options the federal government can pursue to encourage recycling and reuse of electronics.

RESPONSE BY JOHN STEPHENSON TO AN ADDITIONAL QUESTION FROM SENATOR INHOFE

Question. GAO's report recognizes that there is potential for contamination from electronics if they are not managed properly. What specific examples of mismanagement that led to contamination has GAO found?

Response. Instances of improper management of used electronics have been documented overseas, for example, by the Basel Action Network and the Silicon Valley Toxics Coalition. Their findings were confirmed in an investigation conducted by the San Jose Mercury News. These efforts documented practices in China that involved open burning of plastic computer casings, open acid baths for separating precious metals, and human exposure to lead and other hazardous materials. Of note, GAO is not aware of any contamination from used electronics in the United States.

RESPONSES BY JOHN STEPHENSON TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. Your written testimony states that a "lack of oversight over exports could [] discourage environmentally preferable management of used electronics."

Could you please elaborate on this finding, and in particular its potential effects for domestic markets of recycled products?

Response. Some businesses in developing countries with less stringent environmental and human health standards will disassemble used electronics and extract valuable materials without paying the cost of proper worker and environmental protection. As a result, many of these products will "flow" to these countries and potentially expose workers and citizens to hazardous substances. Further, the U.S. recycling infrastructure will be at a competitive disadvantage when compared to these less-responsible overseas operations. In fact, only 22 percent of GAO's survey respondents believe that the export of non-working equipment—which many experts believe is the equipment most often handled irresponsibly—should be allowed. Oversight, such as "downstream" tracking or notification requirements to importing countries, could help ensure that United States-generated used electronics are only exported to responsible entities overseas.

Question 2. The GAO examined EPA's EPEAT program, which establishes criteria for judging electronic products that are designed in an environmentally-sensitive fashion.

Could you please describe how federal and state governments can best promote this type of program to reduce the use of toxic material and increase the recycling rate of electronic products?

Response. Federal and state governments could require electronic products they procure to meet some level of EPEAT criteria—bronze, silver, or gold. Additionally, preference could be given to electronic products that meet higher levels of EPEAT criteria.

Question 3. California and three other states currently have bans on the disposal of cathode ray tubes in municipal land fills.

Please describe the effect of such bans on the recycling rate for electronic waste.

Response. Interviews with state government officials in California and Massachusetts, as well as large, international recyclers, suggest that landfill bans on used electronics substantially increase the amount of used electronics available for recycling. For example, In San Ramon, CA, a 1-day collection even for CRT television monitors yielded 24,000 units. In contrast, in Richmond, Virginia, a metropolitan area 4 times the size of San Ramon but without a landfill ban, a similar collection event (organized by the same electronics recycler as in San Ramon) only yielded about 6,000 monitors.

Question 4. Your written testimony suggests that the costs of taking electronic waste apart to recover valuable material can negatively impact some recycling.

Do you think that manufacturers can facilitate the recycling of electronic products by redesigning their products to be more easily recycled?

Are any manufacturers currently undertaking such redesign initiatives?

Response. Several manufactures have modified their electronics to ease disassembly at end-of-life. For example, Hewlett-Packard designed its DeskJet 6540 printer to snap together so that it could be easily disassembled for recycling. Dell has also taken strides in product design to ease disassembly at end of life. These efforts are voluntary, however, and to date there has been little economic or regulatory incentive for manufacturers to design their products for end of life recycling. European regulations, such as the WEEE directive, are helping to drive manufacturers of consumer electronics in this direction.

RESPONSES BY JOHN STEPHENSON TO ADDITIONAL QUESTIONS FROM SENATOR LAUTENBERG

Question 1. How much is known about whether toxics and heavy metals can leach from electronic units discarded in landfills to possibly contaminate groundwater?

Response. Regarding the issue of toxicity, the research we have reviewed to date is unclear on the extent to which toxic substances may leach from used electronics in landfills. On one hand, standard regulatory tests required by RCRA to determine whether a solid waste is hazardous and subject to federal regulation show that lead, as substance with known adverse health affects, leaches from some used electronics under laboratory conditions. On the other hand, the author of this study told GAO that these findings are not necessarily predictive of what could occur in a modern landfill. Further, a report by the Solid Waste Association of North America suggests that while the amount of lead from used electronics appears to be increasing in lined municipal solid waste landfills, these landfills provide safe management of used electronics without exceeding toxicity limits that have been established to protect human health and the environment. Overall, however, research on the long-term effects of used electronics in landfills is limited, in part because many of them are fairly new products.

Question 2. Does the GAO have a viewpoint on whether "producer take backs" or financing mechanisms such as fees, are most effective?

Response. At this time, the effectiveness of either an advanced recovery fee (ARF) or extended producer responsibility (EPR) system is difficult to determine because the only examples—California's ARF system and Maine's EPR system—are in the beginning stages of implementation. Overall, the effectiveness of these state systems might not necessarily predict their success on a national level because California and Maine adopted them, in part, to address each state's unique challenges. California, for example, has a robust recycling infrastructure capable of handling large volumes of used electronics; and, there was evidence that California citizens had millions of units of historic e-waste in storage. Therefore, California enacted an ARF to provide immediate funding to handle this waste. Maine, on the other hand, has a waste management infrastructure capable of collecting e-waste at consolidation points, but they have a very limited recycling infrastructure. Additionally, state officials wanted to ensure that future electronic products were produced with fewer toxic substances and designed for recycling. As a result, Maine enacted an EPR system to ensure that recycling of e-waste occurs without over-burdening limited recycling resources and to provide electronics manufacturers to design products in environmentally preferable ways in the future.

Recognizing each state's unique waste challenges and concerns, participants in the NEPSI process appeared to be advocating a hybrid ARF/EPR approach before the process was dissolved earlier this year. Supporters of this approach viewed it as a way of dealing with both (1) the need to recycle used electronics in storage (as emphasized in the California approach), and (2) the need to encourage more environmentally-friendly design while at the same time addressing future used electronics (as emphasized in the Maine approach). We will be examining this and other approaches in greater detail during the remainder of our work.

Question 3. I am a proponent of the "cradle to cradle" philosophy which would reduce waste, protect the environment, and stimulate the economy. Could EPA do more to move industries closer to a "cradle to cradle" management system?

Response. Through its voluntary partnerships with industry under the Resource Conservation Challenge, EPA has sponsored numerous pilot projects to make recycling used electronics inexpensive and convenient. While EPA has other "tools" at its disposal, we are working with them to determine what EPA can do to help reduce the level of toxic substances in electronics are to facilitate recycling and reuse at these products' end of life.

RESPONSES BY JOHN STEPHENSON TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Mr. Stephenson, based on research conducted by GAO so far, do you have a recommendation on which of the following systems is the most effective to promote the recycling of used electronics: manufacturer take back or an advanced recycling fee levied at the time of purchase by the manufacturer?

California and Maine adopted their respective ARF and EPR systems, in part, to address each state's unique challenges, such as their individual waste management and recycling infrastructures, but the effectiveness of these state systems is not yet known and might not necessarily predict success on a national level. California, for

example, has a robust recycling infrastructure capable of handling large volumes of used electronics, and there was evidence that California citizens had millions of units of historic e-waste in storage. Therefore, California enacted an ARF to provide immediate funding to handle this waste. Maine, on the other hand, has a waste management infrastructure capable of collecting e-waste at consolidation points, but they have a very limited recycling infrastructure. Additionally, state officials wanted to ensure that future electronic products were produced with fewer toxic substances and designed for recycling. As a result, Maine enacted an EPR system to ensure that recycling of e-waste occurs without over-burdening limited recycling resources and to provide electronics manufacturers to design products in environmentally preferable ways in the future.

Recognizing each state's unique waste challenges and concerns, participants in the NEPSI process appeared to be advocating a hybrid ARF/EPR approach before the process was dissolved earlier this year. Supporters of this approach viewed it as a way of dealing with both (1) the need to recycle used electronics in storage (as emphasized in the California approach), and (2) the need to encourage more environmentally-friendly design while at the same time addressing future used electronics (as emphasized in the Maine approach). We will be examining this and other approaches in greater detail during the remainder of our work.

Question 2. Mr. Stephenson, you testified that several states have banned cathode ray tubes and other used electronics from landfill disposal. How has this impacted the electronic waste recycling rates in those states and would you recommend a national landfill ban?

Response. Interviews with state government officials in California and Massachusetts, as well as large, international recyclers, suggest that landfill bans on used electronics substantially increase the amount of used electronics available for recycling. For example, In San Ramon, CA, a 1-day collection even for CRT television monitors yielded 24,000 units. In contrast, in Richmond, Virginia, a metropolitan area 4 times the size of San Ramon but without a landfill ban, a similar collection event (organized by the same electronics recycler as in San Ramon) only yielded about 6,000 monitors. While a landfill ban appears to have been a key component to the success of recycling in these states and localities, at this time there limited controls over exports and illegal dumping—both of which may increase if a nationwide landfill ban were imposed—and there is no national financing mechanism to ensure that used electronics are recycled or reused. As a result, the ultimate effectiveness of a national landfill ban on used electronics is uncertain.

STATEMENT OF GARTH T. HICKLE, PRINCIPAL PLANNER, MINNESOTA OFFICE OF ENVIRONMENTAL ASSISTANCE

Mr. Chair and members of the Subcommittee:

My name is Garth Hickle and I am with the Minnesota Pollution Control Agency.

Thank you for the opportunity to provide testimony today and share Minnesota's experience with the management of waste electronics. Given the state legislative and programmatic attention devoted to this issue over the past 5 years, congressional attention is an important step toward addressing this complex issue.

The Minnesota Office of Environmental Assistance began to address this issue in 1995 at the request of our state legislature in response to concerns regarding the growing presence of discarded electronic products in the waste stream and the potential environmental impacts of electronics disposal.

While there is debate regarding the actual long-term environmental impacts from disposing of waste electronics in landfills, Minnesota has framed the issue as one of resource conservation and the promotion of economic development opportunities created by the collection and de-manufacturing of old electronic products. The environmental benefits, energy savings, and job creation from promoting "waste as a resource" have guided our thinking as to the rationale for the collection and recycling of waste electronics. It is Minnesota's intent to ensure that residents have convenient access to collection opportunities, and that the infrastructure is sufficient to discourage illegal dumping, abandonment of collected products, and the export of waste electronics to nations with less-stringent environmental standards.

Since 1997, the OEA has facilitated a number of demonstration projects for the collection of waste electronics with participation from manufacturers, local government, and recyclers. Partnerships with individual manufacturers and retailers served to model various collection options and assess costs.

The OEA also participated in several efforts to bring parties together to implement comprehensive programs, both at the state level and nationally. The Office convened a multi-stakeholder cathode ray tube (CRT) task force in 1999, and ac-

tively participated in the National Electronics Product Stewardship Initiative (NEPSI). While NEPSI did not arrive at a consensus regarding how a national program should be financed, the stakeholders did agree on the need for several important elements of a national program: including a broad scope of products beyond just televisions and monitors; performance goals; funding for local collection activities; environmentally sound management standards; and a third-party organization to implement a program.

The Minnesota Legislature has considered legislation for waste electronics each year since 2002. The proposals have ranged from advance recycling fees similar to the program enacted by SB 20 in California to the shared-responsibility approach implemented in Maine. The differing business models and perspectives within the industry that prevented a national approach from emerging from NEPSI have also stymied passage of a state program in Minnesota.

Following the 2004 Minnesota legislative session, the OEA initiated another consultation process, with significant participation from stakeholders, to identify expectations for a program in Minnesota. As part of that effort, the OEA identified the following elements for an effective state program:

- Offering convenient collection options for residents that address a broad scope of products and track purchasing and disposal habits.
- Utilizing existing infrastructure and providing incentives for collection.
- Ensuring accountability for collection and recycling by identified parties.
- Promoting environmentally sound management.
- Providing incentives for design for the environment.
- Supporting private management, to the extent possible, to reduce government involvement in the program.
- Financing the program without relying on end-of-life fees or local government funding.

While developed for Minnesota, the expectations listed above will also be relevant for a comprehensive national program.

This Subcommittee will certainly hear from manufacturers and retailers on the preference for a national approach for business reasons to avoid a patchwork of state programs. A federal approach will also address some concerns faced by state governments grappling with this issue.

From the perspective of state government and consumers, a federal approach may provide a consistent standard and eliminate regional disparities. For instance, in 2003 Minnesota enacted a disposal ban for cathode ray tube containing products, now slated for implementation in 2006. This ban raised a concern among neighboring states, South Dakota, North Dakota, Wisconsin and Iowa, that televisions and monitors from Minnesota would be transported across the Minnesota's border for disposal. A federal framework would eliminate the impact upon border sales if, for instance, one state enacted a consumer-fee-based program while a neighbor state did not. A national program may also greatly simplify administrative responsibilities such as compliance, reporting, and public education.

If comprehensive national legislation is contemplated-a step Minnesota supports-it is important to consider the following:

- Adopting an approach that engages all of the players along the product chainmanufacturers, retailers, and local government, among others-to share responsibility for funding and operating a program. Such an approach will result in a more effective system that provides incentives for more environmentally friendly products in the future, but will not place significant additional burdens on government. Legislation should contain a financing mechanism that recognizes the differing business models within the electronics industry and provide
- Establishing a framework so that products can be added or deleted as the technology and consumer purchasing habits evolve.
- Adopting performance standards and mechanisms for evaluating progress.

However, even if a comprehensive national program is not adopted, there are several steps that the federal government could undertake to support the collection and recycling of discarded electronic products, including:

- Performing data collection and analysis that tracks the sales of new products and recycling and disposal of waste electronics.
- Ensuring a consistent regulatory environment to support the reuse and recycling of discarded products.
- Developing clear standards for environmentally sound management that impose restrictions on the export of waste electronics to countries with less stringent environmental standards.
- Engaging in research and analysis regarding innovative partnerships to manage the program.

It is important to acknowledge that U.S. EPA and others have projects underway to address some of these issues. U.S. EPA deserves significant recognition for the resources and staff that have been devoted to this issue over the past several years including, among others, the support for NEPSI and grants for collection pilots.

Thank you again for the opportunity to be here today. I look forward to addressing any questions you may have.

Summary of Waste Electronics Consultation Process

Conducted by the Minnesota Office of Environmental Assistance
2004

Summary of Waste Electronics Consultation Process

Conducted by the Minnesota Office of Environmental Assistance

Introduction

Following the conclusion of the 2004 legislative session and consideration of House File 882 and Senate File 838, OEA was charged by the Governor's Office and legislative committees to convene a consultation process to inform policymaking on waste electronics during the 2005 legislative session.

The OEA held four meetings with manufacturers and retailers from July through October 2004. In addition, the OEA sponsored two public forums for interested parties such as representatives from local government, waste haulers, environmental advocacy organizations, trade associations, and others.

The meetings and forums were designed to solicit input on a variety of topics related to the management of electronic waste, including financing mechanisms, collection strategies, environmentally sound management standards, and the role of various parties in the collection and recycling infrastructure. Products within the scope of the discussions included televisions, computer monitors, computer processing units (CPUs), laptops, small computer peripherals (keyboards, mice, etc.), and printers as agreed to in the National Electronic Product Stewardship Initiative (NEPSI), a multi-stakeholder dialogue convened from 2001 to 2005 to develop a national approach to managing waste electronics.

Given the lack of agreement among the manufacturers of electronic products on the most efficient and equitable funding mechanism, the majority of the consultation process was devoted to an analysis and discussion of potential financing options to support the collection and recycling of old electronic products.

Description of Policy Options

Three policy options for financing a statewide waste electronics recycling program received significant attention during the meetings.

Option 1: Advance Recycling Fee

Financing: An advance recycling fee (ARF) option requires consumers and business to pay a fee at point of sale on televisions, computer monitors, and laptops. The fee applies to both household and business sales. The accumulated fees will cover all the costs necessary to support the collection and recycling of discarded electronic products.

Manufacturers are responsible for informing retailers which products carry the fee. Retailers will receive five percent of the fee to cover their administrative costs.

Orphaned/abandoned waste: The ARF funds the collection and recycling of the following discarded products: computer monitors, televisions, laptops, CPUs, small peripherals (e.g. keyboards, mice), and printers, regardless of when the product was manufactured or if the manufacturer is still in business.

Program management: The ARF will be transferred to the Electronics Stewardship Association (ESA), a non-profit organization that will be responsible for implementing the program.

The ESA, modeled on the Insurance Guaranty Association (Minn. Stat. § 60C), is to be governed by a board of directors composed of representatives from electronic product manufacturers, local government, retailers and non-governmental organizations. The responsibilities of the ESA will include management of the

collection and recycling program, setting the ARF on an annual basis to ensure that sufficient funds are available to operate the program, and conducting public information and outreach on collection opportunities for Minnesota residents.

Collection: The ESA will reimburse entities such as local government, haulers, retailers, and others engaged in the collection of discarded products. The ESA will offer competitive contracting opportunities for recyclers to process material collected in Minnesota.

Environmentally sound management: The contracts will stipulate environmentally sound management standards to ensure that collected products are handled safely.

State fiscal impact: The advance recycling fee will generate an estimated $15 million per year.

Example: The Electronic Waste Recycling Act enacted in California in 2003.

Option 2: Individual Responsibility

Financing: In contrast to the advance recycling fee funding mechanism, the cost-internalization financing model does not require a visible fee applied to products at point of sale. To compel participation in the program, individual manufacturers have the responsibility to register with the state in order to sell products in Minnesota.

Program management: The individual responsibility mechanism does not create an implementation organization although the manufacturers may choose to do so voluntarily. To fulfill their obligations, individual manufacturers would have the responsibility to transport and recycle material collected at consolidation facilities located across the state. Manufacturers could fulfill this responsibility on an individual basis or by working collectively and contracting for services.

Orphaned/abandoned waste: The amount of product that each company would be responsible for would be determined annually and based upon the percentage of a company's product in the total amount collected for recycling. This same percentage would then also be applied to the collected products of manufacturers that are not fulfilling their responsibility, are no longer in business, or whose manufacturer cannot be identified.

Collection: The individual responsibility approach would not specify responsibility for collection but it is expected that local governments, retailers, haulers, and others will voluntarily provide collection services and ensure that material is transported to consolidation facilities. The consolidation facilities would be designated by the OEA through an RFP process to ensure geographic diversity and performance capability. It is expected that a variety of entities including local government, haulers, recyclers and others would apply to serve as consolidation facilities.

The collection agents may charge a fee to cover collection costs but would deliver the collected material to the point of consolidation for no charge.

State government has responsibility to ensure participation and compliance with this system and would report to the Legislature on progress toward meeting program objectives.

State fiscal impact: No fees are enacted or appropriations required. OEA and PCA estimated that 0.5 full-time equivalent (FTE) staff person would be necessary to accomplish the responsibilities included in language considered by the 2004 Legislature.

Examples: Electronics Recycling program adopted in Maine in 2004; HF 882/SF 838 considered during the 2004 Legislature.

Option 3: Hybrid Financing Model

Financing: The hybrid financing model combines the advance recycling fee (ARF) financing approach for televisions with the individual responsibility model for information technology (IT) equipment. The recycling of computer equipment would be addressed through individual manufacturer responsibility with no fee at point of sale as described above.

Orphaned/abandoned waste: Orphaned/abandoned products would be handled by each product sector and the respective financing method.

Program management: An ARF would be placed on televisions at point of sale and remitted by the retailer to a third-party organization created to manage the program. The third-party organization would have the responsibility for ensuring the transportation and recycling of collected product from consolidation centers.

Manufacturers of IT products would fulfill the program requirements either individually or by participating in the third-party organization established to manage discarded televisions. The IT manufacturers would take back collected products from the consolidation points themselves or contract for recycling services.

State fiscal impact: The OEA has not prepared a fiscal note regarding FTE necessary to carry out the responsibilities for the state.

Example: No hybrid financing mechanisms have been adopted.

Evaluation of Policy Options and Desired Attributes

The OEA identified six attributes necessary for an effective recycling program for Minnesota residents. The OEA analyzed the various financing models against their ability to fulfill the following attributes:

- **Convenient**

  Advance Recycling Fee: Due to the availability of a reimbursement payment for collection services, the advance recycling fee provides an incentive for multiple entities to offer collection services.

  Individual Responsibility: The individual responsibility approach does not assign specific collection responsibilities or provide a defined source of funding for collection, factors that may have an impact on the number of available collection opportunities. Collection agents will be permitted to charge a small end of life fee to cover the costs of collection and transportation to consolidation facilities.

  Hybrid System: As indicated above, the hybrid system would place an ARF on televisions and require individual manufacturer responsibility for IT equipment. However, in order to prevent the cross-subsidization of product categories, the ARF funds would be used for the recycling of products from the point of consolidation only. Due to the presence of an ARF on televisions at point of sale, this may restrict the viability on the use of end of life fees for collection services thus impacting convenience.

- **Accountability**

  Advance Recycling Fee: The advance recycling fee model offers several elements to ensure participation in the program and result in accountability. The advance recycling fee at point of sale ensures that manufacturers that sell products through retailers located in Minnesota will carry the fee. Retailers and manufacturers who sell directly to consumers will be required to notify the Electronic Stewardship Association of their intent to sell products in Minnesota. Ensuring the remittance of the ARF from online sellers remains a concern, particularly for IT equipment, but the OEA is closely monitoring the implementation and compliance of the retail fee in California to accurately assess what enforcement tools will be necessary to ensure adequate program funding.

Individual Responsibility: To ensure participation in the program, the individual responsibility model requires manufacturers to register with the state in order sell products in Minnesota. Individual manufacturers must report annually regarding the amount of waste electronics they managed for recycling. Compelling registration by manufacturers, particularly by those located overseas, may be a challenge but given the individual responsibility program in place in Maine, a precedent has been established.

Hybrid System: The hybrid institutes the accountability mechanisms inherent in the ARF and individual responsibility options for their respective product categories.

- **Environmentally sound management (ESM)**

Advance Recycling Fee: This policy option will promote environmentally sound management of collected waste electronics and ensure that such waste is handled safely and not exported to countries with inadequate environmental standards. This will be executed through contractual obligations between the third-party organization and its vendors.

Individual Responsibility: Ensuring environmentally sound management of products in the cost internalization financing approach would require specific language in statute and some degree of oversight by the MPCA.

Hybrid System: ESM is to be accomplished through contracting requirements for the third-party organization designated for the management of waste televisions. For those IT manufacturers who are not participating in the third-party organization, specific management requirements will be required in statute.

- **Supports existing infrastructure**

Advance Recycling Fee: Due to the availability of a defined source of financing, the ARF policy option may support existing collection infrastructure, particularly operated by local government, more effectively than other policy options. The ARF option may also more effectively utilize existing recyclers due to the presence of collective contracting through the third-party organization.

Individual Responsibility: Since the individual responsibility approach does not require manufacturers to offer collection or raise revenue through a fee, it must rely on voluntary collection efforts by local government, retailers, haulers, and others.

Hybrid System: The hybrid financing approach supports the existing infrastructure to the same degree as the advance recycling fee due to the presence of a fee for televisions and manufacturer responsibility for the collection, transportation, and recycling of IT equipment.

- **Incentives for Design for the Environment**

Advance Recycling Fee: The OEA recognizes the importance of supporting design for environment efforts to promote recyclability of products, reduce toxic constituents, and recognize resource conservation. The proposed recommendation may not provide the same level of incentive for design for environment activities as a strict individual responsibility financing mechanism but the ability of one state to influence design changes using financial incentives may be limited. Recognizing the lack of drivers for design change inherent in the ARF approach, California requires compliance with the restrictions on hazardous substances (lead, mercury, hexavalent chromium and cadmium) adopted by the European Union. It is expected that only a minority of products sold in the US market will now be out of compliance with those restrictions.

Individual Responsibility: Since individual manufacturers are responsible for funding recycling activities for their share of collected products, this approach to financing would provide a more direct

economic signal to manufacturers to further consider design for environment practices. This is particularly true for manufacturers that operate recycling programs for their own and similar products. Given the shorter lifespan and turnover for IT equipment, recognizing and incorporating design-for-the-environment practices is more relevant than for televisions, which have an average lifespan of 15-17 years.

Hybrid System: IT manufacturers have the same incentives for design for the environment as addressed in the individual responsibility approach while the incentive for television manufacturers is negligible.

- **Private management of the program**

  Advance Recycling Fee: With the creation of the Electronics Stewardship Association, a multi-stakeholder board will provide program management and oversight of the program. Not only will the ESA ensure that the necessary parties participate in operating the system, but also ensure that resources from state government are kept at a minimum.

  Individual Responsibility: Since manufacturers are individually responsible for managing discarded products and no fee is collected, few resources from government are required to implement and operate the program. This approach encourages the development of partnerships directly between manufacturers and collection agents such as retailers and haulers.

  Hybrid System: Private management of the program is expected under a hybrid model with television manufacturers participating in a statutorily created third-party organization and IT manufacturers choosing to fulfill their responsibility individually or through the third-party organization.

OEA Recommendation

After an evaluation of the three policy options and the desired attributes, the OEA recommends that the Legislature enact an advance recycling fee (ARF) to finance the collection and recycling of waste electronics. The OEA recommends an ARF based on its ability to provide reliable and defined funding for collection services as well as for orphaned and abandoned products. The OEA also believes that the ARF offers the greatest potential for broad participation from manufacturers and retailers.

Unlike the Electronic Waste Recycling Act enacted in California in 2003, the OEA recommends that implementation and management of the program be carried out by a third-party organization rather than by state government. The third-party organization would be created by statute and managed by a board of directors composed of representatives of manufacturers, retailers, local government, and environmental advocates. This approach engages all parties in program management, increasing the program's overall effectiveness while decreasing the need for state resources.

The management structure of the third-party organization and its ability to execute contracts with recyclers to process collected material offer strong opportunities to achieve cost efficiencies. The third-party organization would require environmentally sound management standards for the collected materials, including restrictions on the export of material to countries with weaker environmental standards.

The OEA recognizes that several parties that participated in the consultation process voiced concerns with the ARF, and will continue to work with those parties to address their concerns.

Description of 2004 Consultation Process

Following the conclusion of the 2004 legislative session, OEA convened a consultation process to examine policy options for legislative action on electronic waste. The process provided manufacturers, retailers, local government, environmental advocacy organizations, trade associations, recyclers, and others an opportunity to offer input and perspectives on various policy options for a state program. Please see Appendix B for a list of consultation process participants.

Manufacturers/Retailers Meetings

First meeting (July 14)

- Introduce process and outline objectives.
- Provide policy parameters from Governor's Office.
- Review legislative proposal from last session and outline approaches in California, Maine, and Alberta.
- Review history of issue in Minnesota (projects and policy).
- Facilitate discussion on various perspectives on financing models.

Objectives: Secure participant understanding of consultation objectives and begin discussion of potential financing options.

Second meeting (August 26)

- Continue discussion of financing models from July 14 meeting.
- Solicit feedback on specific financing models presented to participants.

Objective: Complete review of potential financing options.

Third meeting (September 21)

- Facilitate discussion on draft financing models.
- Introduce discussion of approach to providing collection services.
- Solicit feedback on approaches to development of performance measures.

Objective: Provide input to OEA on draft financing models.

Fourth meeting (October 18)

- Review draft financing options from OEA.
- Provide overview of next steps.

Objective: Secure participant understanding of draft financing options for Legislature.

Multi-stakeholder Forums

First meeting (August 5)

- Present overview of process and objectives.
- Solicit input on financing and collection strategies.
- Facilitate discussion on appropriate role for government.

Objectives: Secure understanding of process to develop recommendations.

Second meeting (October 7)

- Present methodology for determining performance metrics and solicit input on development of environmentally sound management standards.
- Review OEA draft recommendations.

Objectives: Secure understanding of draft recommendations.

Data Analysis

The following data may be useful to formulating a statewide policy on managing waste electronics.

Estimated Number of Electronics Sold in Minnesota in 2003 (units)

- Television sales: 608,000
- Desktop PC sales: 703,000
- Laptop sales: 266,000
- Printer sales: 570,000

Source: *Appliance Manufacturer Magazine*, EIA

U.S. Market Share by Brand

PCs

- Dell: 27.4 percent
- HP: 19.4 percent
- IBM: 4.6 percent
- Gateway: 3.3 percent
- Apple: 3 percent

Source: IDC U.S. data (3rd quarter 2004)

Televisions

1. Sony
2. Panasonic
3. Toshiba — Top five brands: 54.2 percent
4. RCA
5. Mitsubishi
6. Hitachi
7. Philips
8. Samsung — Top ten brands: 76.4 percent
9. Sharp
10. JVC

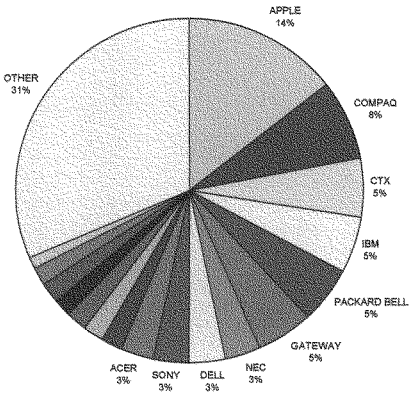
Source: NPD Consulting (2003)

Collected Material by Brand

The OEA conducted an analysis of brands and product vintage for electronics collected during an event in September 2004. The following data illustrates the brands that are being collected for recycling as well as how the return share for a particular manufacturer may help shape their preferred financing option.

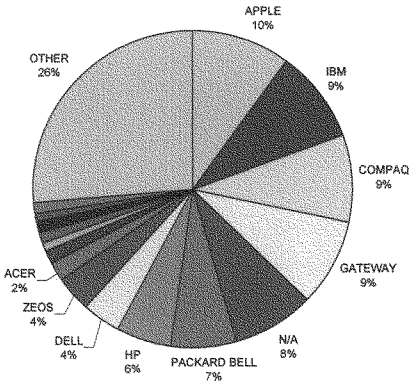
Monitors

Brand	Collected	Share	Weight (pounds)
APPLE	67	14.4%	2,006
COMPAQ	35	7.5%	1,100
CTX	25	5.4%	722
IBM	25	5.4%	649
PACKARD BELL	25	5.4%	670
GATEWAY	24	5.2%	844
NEC	16	3.4%	570
DELL	15	3.2%	596
SONY	15	3.2%	500
ACER	14	3.0%	390
N/A	10	2.1%	324
SAMSUNG	9	1.9%	252
VIEWSONIC	9	1.9%	332
GOLD STAR	8	1.7%	208
HP	8	1.7%	260
ZENITH	8	1.7%	214
MICRON	5	1.1%	188
OTHER	146	31.3%	4,347
TOTAL	466		14,254



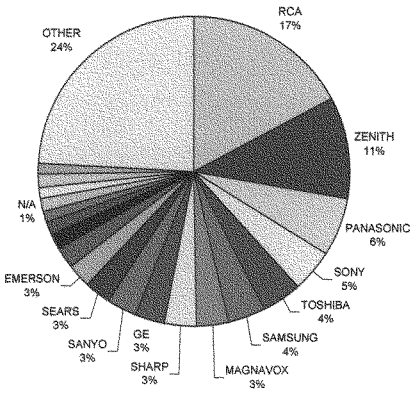
Desktop PCs

Brand	Collected	Share	Weight (pounds)
APPLE	30	10.0%	612
IBM	28	9.4%	668
COMPAQ	27	9.0%	696
GATEWAY	26	8.7%	678
N/A	25	8.4%	686
PACKARD BELL	20	6.7%	434
HP	17	5.7%	543
DELL	11	3.7%	310
ZEOS	11	3.7%	378
ACER	6	2.0%	130
EPSON	4	1.3%	104
NEC	3	1.0%	92
NORTHGATE	3	1.0%	106
PORTICO	3	1.0%	50
TANDY	3	1.0%	74
TIGER	3	1.0%	66
OTHER	79	26.4%	2,100
TOTAL	299		7,727



Televisions

Brand	Collected	Share	Weight (pounds)
RCA	41	17.3%	2,583
ZENITH	25	10.5%	1,552
PANASONIC	14	5.9%	386
SONY	11	4.6%	640
TOSHIBA	10	4.2%	408
SAMSUNG	9	3.8%	338
MAGNAVOX	8	3.4%	504
SHARP	8	3.4%	294
GE	7	3.0%	216
SANYO	7	3.0%	274
SEARS	7	3.0%	274
EMERSON	6	2.5%	152
MITSUBISHI	5	2.1%	326
JVC	4	1.7%	136
FUNAI	3	1.3%	82
MONTGOMERY WARD	3	1.3%	64
N/A	3	1.3%	104
SYLVANIA	3	1.3%	222
SYMPHONIC	3	1.3%	110
WARD	3	1.3%	146
OTHER	57	24.1%	2,851
TOTAL	237		11,662



Residential Material Expected to be Collected and Recycled Statewide

The OEA estimates that if a statewide program for electronic waste is enacted, the following amount of electronic waste from residences will be collected for recycling for 2006-2008.

- 2006: 13.1 million pounds
- 2007: 15 million pounds
- 2008: 18 million pounds

The estimate is based on the per capita amount collected in the Hennepin County program for 2003 and applied statewide. The projection assumes a one percent annual increase in Minnesota's population and a 16 percent annual increase in the amount of material collected. The projected collection volumes from residences are expected regardless of the financing mechanism selected.

Employment Projections

Recognizing the economic development potential of increased waste electronics recycling, the OEA surveyed recyclers to estimate full-time equivalent (FTE). The OEA estimates that one FTE is required to process approximately 1 million pounds per year. This does not include FTE required for collection and transportation services. Given this estimate, the OEA projects the following additional FTE will be necessary to process the expected residential collection volumes from 2006-2008.

- 2006: 13 additional employees
- 2007: 16 additional employees
- 2008: 19 additional employees

Attachment A: Minnesota Electronics Timeline

1995
The Minnesota Office of Environmental Assistance issues **Management of Waste Electronic Appliances**, a report to the state Legislature that developed estimates of the number of waste electronics entering the waste stream and gathered information on the toxic materials they contain. The OEA outlined management options and gave recommendations for improving the handling of electronic products in waste.

1999
The Minnesota Office of Environmental Assistance (OEA) issues a product stewardship policy proposal that names electronics containing CRTs as one of three priority products. The proposal establishes a policy framework that states the principles and goals of product stewardship. The proposal calls on manufacturers to assume some costs and responsibility for getting old products collected and recycled, and outlines a process for bringing industry and government together to set recycling goals.

1999–2000
- The OEA, Sony Electronics, Panasonic-Matsushita, Waste Management's Asset Recovery Group, and the American Plastics Council jointly fund and conduct a statewide electronics collection and recycling project. The three-month project involved 64 collection sites and brought in 575 tons of old electronic products—twice the amount anticipated by the project partners. The project evaluated product composition and yielded valuable findings about the costs and benefits of various collection methods and markets for the materials.

- The OEA and the Solid Waste Management Coordinating Board of the Metropolitan Counties convene a task force on electronic products containing CRTs to examine management and financing options, and to assess various markets for materials from recovered electronic products. Task force members include electronics manufacturers, retailers, recyclers, and local and state government representatives.

2000
Sony Electronics announces that the company will recycle for free any Sony products collected from Minnesota residents. (Note, as of 2004, Recycle America Alliance had established 17 drop-off points in southern Minnesota and the Twin Cities area.)

2001
The National Electronic Product Stewardship Initiative (NEPSI) begins. NEPSI, a multistakeholder dialogue with manufacturers, state and local government, U.S. EPA, retailers, recyclers, and national environmental organizations, is convened to reach agreement on how to establish and fund a national program for the recovery, reuse, and recycling of used electronics.

2002
Representative Ozment introduces legislation establishing a statewide program for waste electronics. Bill is heard in committee, but no vote is taken.

2003
Following consideration of a bill to enact a statewide program for waste electronics, the Legislature enacted a ban on the disposal of products containing cathode ray tubes starting July 1, 2005.

2004

- NEPSI holds its final meeting without reaching a financing mechanism acceptable to all dialogue participants.

- The Legislature considers HF 882 (Rep. Cox) and SF 838 (Senator Higgins).

Attachment B: 2004 Electronic Waste Consultation Process Participants

Manufacturers

• Doug Smith	Sony
• Tim Mann	IBM
• Valerie Pace	IBM
• David Thompson	Panasonic
• Butch Teglas	Philips
• Michael Foulkes	Apple
• Mike Longaker	HP
• Renee St. Denis	HP
• Mark Nelson	HP
• Sonnie Elliot	Lexmark
• Frank Marella	Sharp

Retailers

• Laura Bishop	Best Buy
• Sue Mills	OfficeMax
• Kevin Johnson	Target

State Government

• Senator Linda Higgins	MN Senate
• Mike Bull	Governor's Office
• Bob Eleff	MN House Research
• Marilyn Brick	MN Legislature
• Dave Weirens	Association of MN Counties
• Ellen Telander	MN Waste Wise
• Jim Chiles	MPCA
• Carol Nankivel	MPCA
• Melissa Wenzel	MPCA
• Rep. Ray Cox	MN House
• Rep. Dennis Ozment	MN House
• Jake Hamlin	MN House
• Garth Hickle	OEA
• Art Dunn	OEA Director
• Caleb Werth	OEA
• Anne Gelbmann	OEA
• John Gilkeson	OEA

Local Government

• Laura Villa	Dakota County
• Dave Magnuson	Dakota County
• Amy Roering	Hennepin County
• Dave Kronlokken	Blue Earth County
• George Minerich	Stearns County
• Gary Noren	Chisago County
• Tim Lundell	WLSSD
• Lorilee Blais	WLSSD
• Joe Wozniak	Ramsey County
• Zack Hansen	Ramsey County

• Mike Hanan	Otter Tail County
• Amy Kowalzek	Morrison County
• Phil Eckhert	Hennepin County
• Mike Brandt	Hennepin County
• Steve Steuber	Scott County
• Paul Henrikson	Lyon County
• Jim Kordiak	SWMCB
• Nicola Blake-Bradley	Sherburne County
• Mike Cook	Rice County
• Paul Pieper	Rice County
• Rick Frank	Houston County
• Curt Gadacz	Lake County
• Doug Morris	Crow Wing County
• Anne Morse	Winona County
• Gene Mossing	Olmsted County
• Roger Schroeder	Lyon County
• Kent Severson	Clay County
• Ted Troolin	St. Louis County
• Susan Young	City of Minneapolis

Environmental Organizations

• Nina Axelson	Minnesota Center for Environmental Advocacy (MCEA)
• John Curry	Minnesota Center for Environmental Advocacy (MCEA)
• Cynthia Moore	WI DNR
• Tim Rudnicki	Computer Take Back Campaign
• Robin Schneider	Computer Take Back Campaign
• Paul Gardner	RAM
• Barry Tilley	SWMCB
• Ted Smith	Silicon Valley Toxics Coalition
• Cheryl Lofrano-Zaske	RBRC
• Susan Hubbard	Eureka Recycling

Trade Associations

• Todd Iverson	Ewald & Associates
• Marnie Moore	Cook Hill Girard
• Judy Cook	Cook-Hill-Girard
• Kathie Doty	Richardson Richter
• Bob Hentges	Faegre & Benson
• Buzz Anderson	MN Retailers Association
• Lloyd Grooms	Winthrop & Weinstein
• Matthew Lemke	Winthtrop & Weinstein
• Peter Lindstrom	MN High Tech Association
• Peg Larson	RCS Consulting
• Kate Theisen	Richardson Richter
• Doug Carnival	McGrants Shea
• Sarah Psick	Legislative Consultant, MN Hi-Tech Association
• Mike Robertson	MN Chamber
• Tony Kwilas	MN Chamber

Recyclers

• David Paulson	MN Computers for Schools
• Tamara Gillard	MN Computers for Schools
• Jim Vosika	J.R.'s Appliance
• Katy Boone	J.R.'s Appliance
• Ryan Laber	Asset Recovery Corp.
• Julie Ketchum	Waste Management/RAA

Other

• Robert Dunn	Moderator
• Joanie Burns	Department of Environmental Protection – IRE

RESPONSES BY GARTH HICKLE TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Mr. Hickle, what are the consequences for your state if Congress fails to enact national electronic waste legislation?

Response. With the July 1, 2006, implementation date for the ban on the disposal of cathode-ray-tube-containing products looming and the expected increase in disposal due to the transition to digital television scheduled for later in the decade, it is necessary that a program be in place for the collection and recycling of waste electronics. The Minnesota Legislature is scheduled to address this issue in the 2005 legislative session, but the prospects for enacting a comprehensive program are unclear at this time.

If Congress does not move forward with legislation for waste electronics, Minnesota will continue to examine legislative options for e-waste and promote proper management of waste electronics.

In lieu of comprehensive national legislation, Congressional action to facilitate harmonized state legislation may be a useful step. Such action could be the authorization of state compacts to assist with program administration and, potentially, fee collection and disbursement if that option is selected.

Question 2. Mr. Hickle, what prompted Minnesota to initiate its landfill ban on Cathode Ray Tubes and how effective has it been? Based on Minnesota's experience, would you endorse a national landfill ban?

Response. Following the deliberation of legislation to enact a comprehensive program for waste electronics during the 2003 session, the Minnesota Legislature enacted the disposal ban as a step toward restricting the disposal of CRT-containing products and raising public awareness of the need to recycle monitors and televisions.

Minnesota's disposal ban is scheduled for implementation in 2006, so it is difficult to assess the potential impact on the solid waste management system. A national ban on the disposal of CRTs and other electronic products would eliminate regional disparities within the solid waste management system and ensure consistency with the requirements for commercially generated CRTs.

RESPONSES BY GARTH HICKLE TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Questions 1a. Minnesota has identified seven elements for an effective state recycling system for electronics. These elements include providing incentives for environmentally-safe designs of products and a financing system that does not rely on end-of-life fees or local governments funding.

What types of incentives do you think are most effective for increasing the number of products with an environmentally-safe design?

Response. There are three principal policy tools that serve as incentives for manufacturers to increase Design for Environment (DfE) activities. The first is a financial obligation to collect and recycle products, ensuring feedback between design, manufacturing, and disposal. The second is restrictions and/or bans on the use of certain substances, such as the EU Directive on the Restrictions of Hazardous Substances (RoHS). Third, purchasing standards that specify DfE attributes, such as the EPA's EPEAT tool, act as a marketplace driver for enhanced product design.

Question 1b. What type of recycling-promotion system do you think can most efficiently promote recycling here in the United States?

Response. The key to an effective recycling program in the United States is clear guidance for consumers regarding collection options, combined with a financial incentive for collection entities to offer service. Recyclers, retailers, local government, and even charities have indicated an interest in establishing permanent collection services but require funding for sustained and adequate service.

It is also important that manufacturers share responsibility for financing, public education, and in some cases direct management of the collection and recycling system.

Question 2a. One of the concerns with a lack of national standards for recycling consumer electronics is that some businesses do not have strong environmental practices.

Have you heard of any problems with businesses accumulating electronic products that were not recycled?

Response. There have been at examples of accumulation and abandonment of discarded waste electronics in Minnesota counties in recent years. In Hennepin County six instances of illegal dumping have occurred since 1999. The most prominent example was a company purporting to be a recycler that aggregated old computers,

removed valuable components, and abandoned the remaining material in a warehouse.

Question 2b. And, if so, what are the potential problems associated with the accumulation of such waste?

Response. Fortunately, the environmental impacts from the cases identified above have been minimal. However, such cases have required substantial resources from the county and the state to resolve the situation.

Question 3a. Your testimony refers to the need for clear standards that impose restrictions on the export of waste electronics to countries without strong environmental protections.

Please describe the most important types of standards that you think are needed on exports to overseas recycling operations.

Response. Due to the potential environmental and public health impacts of improper management of waste electronics, this is a critical area for attention by the federal government. Export should comply with the Organization for Economic Cooperation and Development (OECD) control system that is implemented by national laws and regulations of OECD countries and the Basel Convention.

Question 3b. Please also describe any relevant international laws that incorporate such export controls.

Response. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the most relevant international treaty that addresses export and movement of waste electronics.

Question 4. Minnesota enacted a ban on the disposal of cathode ray tubes in 2003, but has delayed implementation until 2006 out of concerns voiced by surrounding states that Minnesota would export it electronic waste.

What steps do other states want Minnesota to take before implementing this ban?

Response. It is my understanding that neighboring states would prefer Minnesota institute a comprehensive program for managing e-waste to ensure that adequate collection and recycling opportunities exist within our borders. Such a program would include a robust public information and outreach component to inform Minnesota residents of existing collection opportunities.

Question 5. What are the best current policies for encouraging the least amount of hazardous substances in electronic products and the largest amount of recycling? Are any governments pursing such policies? If so, what is your assessment of the implementation of those policies?

Response. Both the European Union and the state of California have enacted restrictions on the use of certain substances such as heavy metals (lead, mercury, hexavalent chromium, and cadmium) and certain flame retardants in electronic products, as well as instituting programs to manage waste electronics at the end of life.

Several states, including Minnesota, have contemplated legislation that would adopt the RoHS restrictions or add additional substances to the list of restrictions (typically an expanded list of flame retardants).

The RoHS restrictions do not come into force in the EU until July 1, 2006, so assessing progress toward meeting the goals is difficult.

Question 6. The Council of State Governments/Eastern Regional Conference and the Northeast Recycling Council are attempting to develop a consistent policy approach for e-waste recycling programs.

Do you think the system discussed in their draft system could efficiently increase e-waste recycling and promote public health protections from exposure to toxic substances?

Response. The draft policy developed by the Northeast Recycling Council and the Council of State Governments is an important step toward regional consistency, incorporating many of the attributes of both the advance-recycling-fee and producer-responsibility models promoted by members of the electronics industry. The manufacturer-paid fee will engage manufacturers in directly funding the system, but does not obligate them to establish their own collection and recycling infrastructure. This funding mechanism will also reduce the number of fee payers, reducing administrative and compliance responsibilities for state government.

The financing approach will create sufficient funding to spur the development of an expanded collection infrastructure as has happened with the program in California.

RESPONSE BY GARTH HICKLE TO AN ADDITIONAL QUESTION FROM SENATOR LAUTENBERG

Question. Minnesota is one of the States with the longest records in trying to address electronic recycling. Could you give me your opinion on whether "producer take backs" or financing mechanisms are the most effective recycling method?

Both methods of establishing a program for managing waste electronics have distinct advantages, particularly if they ensure a mechanism for funding collection activities. However, after thorough consideration of models enacted or proposed in the United States, the Minnesota Pollution Control Agency recommended a fee-based system to finance the program. A fee-based program offers a level playing field and generally assures sufficient financial resources for implementation. As referenced earlier, a manufacturer-paid fee, rather than a retailer-administered fee, will reduce concerns with administration and compliance.

STATEMENT OF SHEILA DAVIS, EXECUTIVE DIRECTOR, SILICON VALLEY TOXICS COALITION

Mr. Chairman and Committee Members:

I am Sheila Davis, and I am the Executive Director of the Silicon Valley Toxics Coalition. I want to thank you for the opportunity to speak to you today about the very important issue of electronic waste.

The problem of electronic waste in the United States is becoming critical. Discarded computers and other electronic products are the fastest growing part of the waste stream. And these products contain a lengthy list of toxic chemicals, which cause some serious health effects when they leak out of landfills and into our groundwater, or are incinerated into our air.

But less than ten percent of discarded computers are currently being recycled, with the remainder getting stockpiled or improperly disposed of. Fifty to eighty percent of the e-waste collected for recycling is actually being exported to Asian countries which have no infrastructure to accommodate the hazardous properties of e-waste. Due to horrific working conditions and no labor standards in many of the developing countries where e-waste is sent, women and children are often directly exposed to lead and other hazardous materials when dismantling the electronic products to recover the few valuable parts for resale.

Here, in the photo shown, you will see a woman who works in one of these dismantling shops in Guiyu, China. You will see that she has no protective equipment whatsoever. Yet she is about to smash a cathode ray tube from a computer monitor in order to remove the copper laden yoke at the end of the funnel. The glass is laden with lead but the biggest hazard this woman faces here is the inhalation of the highly toxic phosphor dust coating inside this CRT. The monitor glass is later dumped in irrigation canals and along the river where it leaches lead into the groundwater. The groundwater in Guiyu is completely contaminated to the point where fresh water is trucked in constantly for drinking purposes.

[Photo 2001 Copyright: Basel Action Network]

So why does the computer that I turned in, at a local "recycling" event in California, end up in China, at this woman's workplace? Why didn't my computer get dismantled and recycled here, like I thought it would. The answer is that the market for recycling e-waste here doesn't work. The materials used in these products are so toxic, it's very expensive to recycle them. There are some "good recyclers" who

are actually trying to recycle the products as extensively as technology allows, but this requires manual processing, and protecting workers from exposure to the toxic chemicals is very expensive. The economics just don't work for most recyclers. So they look for the cheaper, low-road solutions, and cream off the parts that there is a local market for, and ship the rest across the ocean to become someone else's problem. Or they use low wage prison labor for disassembly, which further undermines the chances for a healthy recycling market in this country.

So how do we fix this problem? We think the solution is to create incentives for the market system to work here. And we need to do two things to make that happen:

First we need the products to be easier to recycle. The economics of recycling will NEVER work unless these products are easier, and therefore cheaper, to recycle. Part of that means using less toxic materials. Part of that means designing them so they are more easily disassembled for recycling, without relying. on prison labor or women and children in China. Here's an example of what I mean by designing for easier recycling:

A representative from a printing manufacturer told me a discouraging story about recycling at his company. He said that designers worked with the recyclers and found that if they simply added a $1.25 component part to the new line of printers it would make the printer easier to disassemble and cheaper to recycle. But the design team was told not to include the part because there is no guarantee that the printer would be recycled, so the added cost could not be justified.

So here, the producer was not motivated to change their design because they were not concerned about the recycling end of their product's life.

So the second thing we need to do is to get the producers to take responsibility for their products at the end of their useful life, so that they do have this incentive. If the producers (and here I mean the manufacturers and brand owners) have no connection to, or responsibility for their products at disposal time, then what incentive do they have to modify their designs for better recycling, or even better reuse of their products? The answer is none—they have no incentive to do anything different.

But what if the companies did have responsibility for taking back their products for recycling? What if that was just part of their normal operation, that each company had to recycle a significant portion of its old products each year? They would simply build these takeback and recycling costs into their pricing structure. But to be competitive, (and cut their recycling costs) they would innovate, redesign, and end up with computers that were cheaper to recycle. Less toxic materials would be used, so recycling would be easier and cheaper. And there would be no reason to even think about having to use taxpayer money to solve this problem. The market would work.

So this is the legislative solution that we are encouraging our lawmakers to adopt, the approach that is called Producer Responsibility. Of course, this is a far reaching, complex solution, with many components that can't be covered in a short testimony. But we think it's the only solution that will correct the market forces that currently send my old computer into a landfill or to a village in China. So my message here today is that this is a big picture problem that calls for big picture solutions. It won't be solved with partial fixes like tax breaks or making consumers pay a recycling fee. I encourage our lawmakers to seek the kinds of changes that will actually make the market take care of the problem of electronic waste.

RESPONSES BY SHEILA DAVIS TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Ms. Davis, in your testimony, you advocated a Producer Responsibility approach to create incentives to manufacturers to consider the full life-cycle costs of their products and to design products that are easier to recycle. I've heard concerns, however, that a true producer responsibility approach is impractical. Please comment on whether you think it is economically feasible to overcome the logistical hurdles needed to collect and transport end of life products back to their original manufacturer for recycling?

Response. There is no doubt that this is a complex issue, and effective solutions will not be simple. It will require companies to set up infrastructures (individually or collectively) to manage this system. But it is economically feasible, because the companies will incorporate their cost into their pricing structure for their products. If anything, it will level the playing field between companies who currently have a significant recycling program, and companies who are currently making no significant effort to recycle their products. All of these same companies are already implementing this system in Europe right now, in order to meet Europe's deadline (set

by the WEEE directive) of August 13. (And the European program is far more demanding, since it includes home appliances.) We think that many companies would end up funding a third-party organization (TPO) which can handle all of the logistics, contracts, etc. and benefit from economies of scale. One example of this called the European Recycling Platform (ERP), which is a combined effort of Sony Europe, Hewlett-Packard, Braun and Electrolux to collectively manage their takeback obligations across Europe. (See http://www.erp-recycling.org.)

Question 2. Ms. Davis, your testimony details the unsafe recycling of electronic waste in China. Do you think that the export of electronic waste should be banned?

Response. Yes, exporting of hazardous electronic waste (see discussion below of relevant definitions) should be banned to China and the dozens of other developing countries who are not members of the Organization for Economic Co-operation and Development OECD or the European Union (EU) for two reasons. First, exporting these wastes to China and these countries violates international law (1986 OECD Decision, discussed below). Second, developing countries like China and India have no effective infrastructure for handling these materials in a safe, environmentally sound way, so exporting our hazardous wastes knowing that this is the case constitutes a blatant form of environmental injustice.

International Laws Around Waste Exporting.—There are two relevant international laws or treaties that address hazardous waste export: the Basel Convention (which the United States has not ratified) and the OECD Decision (which the United States ratified, but doesn't enforce). The United States could take giant steps in addressing the e-waste export problems by ratifying the Basel Convention or even just enforcing the OECD Decision, which we are violating. Below is an explanation of both laws and how they would help with this problem.

Basel Convention.—Most countries in the world (166 so far) have ratified the international treaty restricting the trade in hazardous wastes, known as the Basel Convention.[1] All developed nations of the world except the United States have ratified the Basel Convention and are thus legally bound to strictly control Basel listed hazardous waste exports. The Basel Convention called for, at a minimum, all trade in hazardous wastes to be preceded by government to government notification and the receipt of consent. The treaty also called for guarantees of environmentally sound management, and a general prohibition against trade in hazardous wastes with non-Parties.

Further, the Parties in 1995 have agreed to amend the treaty to include a full prohibition on all exports of hazardous wastes from OECD countries, EU countries, and Liechtenstein (totaling 37 countries) to all countries outside of that group. This is known as the Basel Ban Amendment which now has garnered 58 of the 62 ratifications necessary for it to enter into force. More significantly, even prior to entering into strict legal force, 30 of the 37 countries to which the export ban applies have already implemented it in their national law.

The United States has received Senate advice and consent to ratify the original treaty, but has not as yet asked for the advice and consent for the Basel Ban Amendment. But the fact that the United States has not approved the Basel convention is a problem for two reasons:

(1) Basel would prevent the United States from sending hazardous waste to China and other developing countries, and

(2) Until the United States does ratify the Basel Convention, we can't legally export wastes to most other "developed" countries, because all the Basel Parties are prohibited from importing hazardous wastes from the United States. This is because Parties are forbidden from trading with non-Parties such as the United States (Article 4, Paragraph 5), unless they have signed a special ratified a bilateral or multilateral agreement with that possesses an equivalent level of control to that of the Basel Convention. The only such agreements the United States has signed are the OECD agreements and a bilateral accord with Canada. The OECD has treaties binding on the United States, governing the transboundary movement of hazardous waste, with direct relevance to electronic waste generated here in the United States. Yet the United States has failed to implement many of these OECD obligations (in

[1] Full name is Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. (www.basel.int).The Basel Convention is a multilateral environmental agreement under the auspices of the United Nations Environment Program (UNEP) that is noted for being the first international treaty that promotes environmental justice. It was designed to protect developing countries from being disproportionately burdened by hazardous wastes via trade, simply due to their economic status. The original treaty called for a minimization of transboundary movements of hazardous wastes and national self-sufficiency in waste management by all countries (see www.basel.int).

RCRA, etc.), resulting in the uncontrolled exports of our hazardous wastes to some of the poorest nations in the world.

Organization for Economic Cooperation and Development Decision.—While the United States has not ratified the Basel Convention and therefore is technically not bound by it, we have ratified and agreed to a 1986 OECD accord which would require that all exports of hazardous wastes to non-OECD countries be controlled similarly to what is required under the Basel Convention. However, the United States is failing to implement this agreement for hazardous electronic wastes.

In 1986, the Organization for Economic Cooperation and Development (OECD) adopted Council Decision-Recommendation C(86)64(final)[1] (OECD Decision) which has to do with hazardous wastes exported from the 30 developed nations who comprise the OECD. Decisions of the OECD Council are legally binding upon Member countries at the time of the adoption of the decision.[1] Since the United States was a member country in 1986, the OECD Decision is legally binding on the United States.

There are several elements in this OECD Decision that could address this problem of e-waste export, but none of them are actually being enforced, and the United States violates all four:

1. The United States should monitor and control exports, including prohibiting certain exports. (The United States has avoided restricting export of electronic waste by selecting a definition that does not define it as hazardous waste)
2. The United States should use the same strict controls on exporting hazardous wastes to developing (non- OECD) countries as to developed (OECD) countries.[2]
3. The United States should not send hazardous wastes to non OECD countries without their consent.
4. The Unite States should not send hazardous waste to non OECD countries unless they are sent to an adequate disposal facility.

Definitions of what should and shouldn't be banned.—*To be banned*: The export of non-working or untested electronic equipment or parts containing hazardous materials, as defined internationally (see below), should most definitely be banned to all non-OECD/EU countries for recycling, major refurbishment[3], and/or disposal. Also, any used electronics must be banned from going to any country that has domestic laws forbidding the import of those electronics, otherwise those U.S. exports result in the violation of laws in recipient countries. Further, until the United States ratifies the Basel Convention they should not trade in Basel-listed wastes with any of the 160+ countries that have ratified the Convention. To do otherwise violates the laws of the importing country.

Not to be banned.—Tested working equipment going into the reuse market, or equipment needing minor repairs[4] does not need to be banned for export, as working equipment is considered a product, not a waste, under international definitions. Additionally parts that are not considered hazardous such as power supplies, copper wires and cables, clean plastic housings etc. need not be banned from export.

Which waste components are to be controlled (Basel listed hazardous e-wastes).—At a minimum, cathode ray tubes (including leaded glass cullet), circuit boards made with lead solder, components containing beryllium or beryllium copper, items containing mercury, beryllium, PCBs, or the equipment that contains any of the above. Likewise, any electronic equipment that in any form or units needing major repairs that contain these materials.

Consistent Definitions.—The United States has not harmonized its definitions of hazardous wastes with the global ones in use by most other nations (*www.basel.int*). U.S. law (The Resource Conservation and Recovery Act) previously controlled hazardous wastes even for export, but industry succeeded in lobbying for de-listings from waste definitions for recycling, resulting in an ugly loophole where the United States in the only country in the world that does not consider electronic waste, lead-acid batteries, and other known hazardous wastes from being controlled from international trade (dumping on developing countries). While this de-listing made some sense for domestic-only transactions, it results in a gross violation of laws in other countries as well as a violation of the principle of environmental justice.

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[2] Transfrontier shipments between OECD member states of cathode ray tubes (CRTs), and/or CRT glass, for example, must in fact be controlled within the OECD as it is part of the "amber" list under Council Decision C(92)39/Final, as amended by C(2001)107/Final (governing recycling trade in hazardous wastes between Member States).

[3] Major repairs are any repairs that result in the removal or replacement of hazardous materials/components as defined in the Basel Convention, www.basel.int.

[4] Minor repairs are any repairs that do not result in the removal or replacement of hazardous materials or components, as defined in the Basel Convention, www.basel.int.

Conclusion on Export issue.—In conclusion, it is imperative that Unite States legislation finally prohibits the export to any non-OECD/EU of any electronic waste that is regulated under the Basel Convention and OECD treaties. At a minimum, this includes cathode ray tubes (including leaded glass cullet), circuit boards made with lead solder, mercury, beryllium, PCBs, and any wastes or units needing major repairs that contain these materials.

Much more information about this issue can be found in our report "Exporting Harm: The High-Tech Trashing of Asia which can be downloaded at: www.ban.org.

Question 3. If the recycling of electronic waste were profitable, more businesses would be doing it and waste disposal would not be as big a problem. In your opinion, what are the economic barriers to making recycling of electronic waste economically viable?

Response. The major barrier to making recycling economically viable is that our solid waste infrastructures reward disposal rather than recycling. Our existing solid waste infrastructure was developed and engineered for the purpose of disposing of materials in municipal landfills. The federal government should provided leadership in setting standards and goals and promoting policies that support responsible e-waste recycling. The current e-waste recycling system which depends on voluntary standards encourages sham recycling and penalizes legitimate recyclers who pay living wages, protect their workers health and safety and invest in recycling equipment. Responsible recyclers can not financially compete with sham recyclers who dump or burn e-waste in developing countries or engage in dirty recycling that takes advantage of child labor or prison labor. Similarly, existing regulations do not reward manufacturers who pro-actively invest in product designs that facilitate recycling.

The Federal Government has the capacity to eliminate barriers to recycling and support e-waste recycling industries by enacting the following policy changes.

(1) Design for recycling. Require electronic manufacturers to incorporate the cost of end-of-life-management into a product's pricing structure. Incorporating end-of-life-management into the price of the product provides incentives for manufacturers to invest in product designs that bring down the cost of recycling and increase the value of the recovered materials. This also eliminates the need for consumer recycling fees and/or government taxes that subsidize recycling businesses to recycle electronic products that were not designed for recycling and contain very limited amount of valuable materials.

(2) Protect U.S. consumers from sham recyclers. U.S. customers recycle their products with the intention of protecting human health and the environment. The lack of e-waste industry standards, government monitoring and oversight defies public confidence in recycling and leaves well-meaning citizens vulnerable to brokers and "front men" who say that they are recycling e-waste but are really exporting the e-waste overseas and dumping it in developing countries or endangering health and safety of entire communities by recycling in horrendous conditions. Banning the export of non-working or untested electronic equipment or parts containing hazardous materials (as defined in the Basel Agreement) would close the export loop hole and protect human health and the environment and promote consumer confidence in e-waste recycling.

(3) Develop and enforce e-waste recycling standards. Currently there are few e-waste recycling industry standards. For example, there is not an accepted e-waste recycling certification or performance auditing system. There is a very limited understanding of worker exposure to hazardous materials at e-waste recycling facilities or the appropriate types of worker protective measures and equipment needed. There are no accepted "best practices" for demanufacturing electronics or standards for acceptable levels of contamination in recovered material.

(4) Establish national e-waste recycling goals. Long-term national e-waste recycling goals are key to the development of an economically viable e-waste recycling industry. Thus, national recycling goals should reward electronic manufacturers whose products are made with materials that contain few contaminants, can be easily recycled and that retain market value. The federal government can further support the e-waste recycling industry by harmonizing national e-waste recycling goals with federal environmental preferable purchasing guidelines for electronics. For example, new federal purchasing guidelines will give preference to electronic products in which 90 percent of materials and components (by weight) are reusable or recyclable within the current infrastructure and use demonstrated technologies.[5] The

[5] Electronic Product Assessment Tool (EPEAT) Criteria Worksheet Draft, 9–20–04

federal government could encourage profitable recycling industry by incorporating this guideline into other policies.

(5) Federal investment in e-waste recycling research and development. A public investment in e-waste research and development will provide non-proprietary technology that would potentially improve and contribute to regional and national infrastructure development.

E-waste research and development needs:

- Work measurement studies that can be shared throughout the industry,
- Automation of disassembly systems that reduce labor cost and protect worker health and safety
- University green chemistry and materials science that helps manufacturers determine the impact of materials throughout the lifecycle of their products
- Affordable materials separation systems that produce a clean stream of recovered materials
- Identification of end market for recovered materials
- Recycling facilities warehousing and inventorying systems
- Worker health and safety studies that include health monitoring and improvements in ergonomics
- Development of affordable plastic identification equipment
- Open source website that posts latest studies, provides information about specific products recycling, disassembly and best practices
- Tests and reports on prototype recycling equipment
- Collaborate between recyclers and Original Equipment Manufacturers (OEMs) to overcome barriers to recycling products before the products are introduced into the consumer market

Question 4. What are the consequences if Congress fails to enact national electronic waste legislation?

Response. Clearly, this is a national problem that calls for a comprehensive national solution. There are economies of scale to be gained on a national level. Sales, distribution and marketing patterns for these companies are national. But if Congress fails to act, the states can also pass legislation to address this problem. We think that because this is a complex issue, there are advantages to setting it up at the state level first, before trying to tackle it on a national level.

Question 5. Ms. Davis, your testimony also discusses the lack of recycling standards in China, and, as you know, there are none in this country. Would a Federal program to certify recyclers in the United States address your concerns and lessen the export of electronic waste?

Response. The lack of recycling standards in China has nothing to do with the illegality of the United States shipping its hazardous e-waste there. U.S. exports of such waste not only violate China's obligations under the Basel Convention, but also violate China's domestic import bans on this material, and should not be occurring, regardless of the level of technology or standards in China. China has ratified the Basel Convention and its Ban Amendment, and is a non-OECD country; the United States has not ratified the Basel Convention, and is an OECD country. We should be looking to handle our own hazardous waste problems domestically rather than exploit weaker economies with these types of problems. This type of environmental injustice is not acceptable in the United States and it should not be acceptable to dump our wastes on the world's poorest communities either.

While there is a desperate need for national recycling standards here in the United States and in all countries, these standards will only be meaningful if those standards explicitly forbid that export. This is due to the fact that there will be very little waste to manage domestically if export is allowed, and on the other hand, it is impossible to enforce a standard extraterritorially, particularly in countries that lack the infrastructure to properly enforce or monitor such standards.

RESPONSE BY SHEILA DAVIS TO AN ADDITIONAL QUESTION FROM SENATOR LAUTENBERG

Question. Your description of women and children dismantling toxic equipment by hand is very disturbing—and something we must try to stop. Since it will take years to get a U.S. system for e-recycling in place, does the Coalition have any short-term recommendations for improving this situation?

Response. One of the most important and overdue things the United States can do is implement the 1986 Organization for Economic Cooperation and Development (OECD) Council Decision-Recommendation C(86)64(final)[1] treaty described above in the Resource Conservation and Recovery Act. This is already a legal requirement

of the United States. Doing this shouldn't even be controversial. It requires no advice and consent, but just requires that Congress mandate that legislation to implement the requirement be drafted and adopted. This will have the immediate effect of requiring minimal controls on export and curtailing a great deal of it. It is not the ultimate solution, which involves passing EPR and toxic phase-out legislation, ratifying both the Basel Convention and the Basel Ban Amendment, but it will create a major dam against the tsunami of e-waste trade.

RESPONSES BY SHEILA DAVIS TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. What do you think the main advantages and disadvantages are of using market-based systems—such as product stewardship—to encourage recycling versus consumer-financed incentives?

Response. There are four significant advantages to a market based solution:

Financing shift to producers, not taxpayers.—This will be a lasting, far-reaching solution that doesn't require taxpayer funds. By giving the producers the financial responsibility for this sytem, taxpayer money, which currently pays for most local recycling programs, would no longer be needed. The ARF system uses the legislature to set a specific fee on products when they are sold. But if these fees turn out to be inadequate to cover the costs (and the legislature has not acted to increase them), then either taxpayer money will make up the difference, or less recycling will happen. The quantities of e-waste that need recycling will continue to grow, so we need a solution that can easily grow with it.

Drives more recycling.—Once the producer takeback system is in place (assuming it has important components like recycling goals) it will drive more recycling to occur because the companies will have goals to meet. The consumer advanced recycling fee (ARF) system has no real drivers to make more recycling happen. It's simply a system to collect some fees to pay for some recycling.

Incentive to design for the environment.—Another advantage to this system is that the companies who manufacture the products have an incentive to reduce the problem, by reducing the toxics in their products. While some companies are pursuing "design for the environment" goals, many are not. This system would give them a financial incentive to do so.

Restricts export dumping and sham recycling.—The producer takeback model includes provisions for making sure the products are actually recycled safely, not exported to third world countries. By having the producers charged with the responsibility for working with responsible recycling vendors, we can fix one of the biggest problems with electronics recycling in this country—illegal export. The ARF model, by being just a fee generation system, doesn't alter the way things are done, just who pays.

The main drawbacks of this system are: (1) its comprehensive approach makes it more complicated to establish, and (2) because it requires a large commitment from the producers, it will be resisted and challenged by industry.

Question 2. Your testimony provides vivid and disturbing details concerning the lack of public health and environmental protections at recycling operations in China. How widespread of a problem is the export of electronic waste to countries that lack adequate environmental protections?

Response. The problem is severe and widespread, due to the sheer economics of the trade, and the completely unregulated export of e-waste from the United States. We believe that 50–80 percent of what is being collected for recycling, finds its way offshore to these types of conditions. Because the United States is failing to 'control and monitor' its exports of hazardous e-waste despite its OECD obligations to do so, there are no hard numbers indicating the exact amount going offshore. However, a number of environmental groups and reporters have documented numerous sites in China, India, Pakistan, and elsewhere. (www.ban.org, www.toxiclink.org, www.greenpeace.org) There are also many reports of sites in Malaysia, Indonesia, and Viet Nam. African and South American nations are receiving millions of cell phones and computers, some of it waste when it arrives, with little to no hazardous waste facilities to properly manage the toxic materials. Greenpeace is about to release a report documenting extremely high levels of toxins found at electronic recycling sites in China and India. Also available will be photos of labels (asset tags) from computers found in these 2 countries, on riverbanks, at primitive 'recycling' operations, and in openly discarded mountains of electronic waste. Limited health studies have been done on populations living amongst these toxic recycling yards in Guiyu, China, by both the Medical College of Shantou University, in the Guangdong Province of China (attached), and by Greenpeace China.

It must be understood, however, that while many of these developing countries may claim to have (or could soon have) the technology to perform electronics recycling, their economies clearly cannot support a full array of infrastructural and democratic, social support systems and safety nets that should be in place to protect them from the dangers of recycling. For instance, they have almost no occupational health equipment, training, clinics, legal remedies for damages, governmental monitoring, and enforcement, of standards, etc. No doubt, if these existed, then the economies would be similar to developed nations; and the exploitive incentive to export would no longer exist as the waste management costs would have been fully internalized. Any exports to weaker economies equates to a violation of principles of environmental justice. It is therefore essential that the United State strategy does not entail finding ways to justify continued export based on exporting technological fixes.

Question 3. What, in your opinion, are the pressures that promote the exportation of e-waste to other countries?

Response. The primary pressure to export e-waste is, without a doubt, an economic one in the absence of legislation. Exporters can (a) claim they are involved in recycling, (b) demand payment from consumers believing that recycling is the right thing to do, and (c) then get paid again at the back end by the Chinese broker for the raw value of the equipment sold. When there are no U.S. regulations limiting the options of export and prison labor, many waste generators will opt for making money off their hazardous e-waste, rather than incurring an expense to ensure that it is properly managed in ways that won't impact citizens and the environment in any country.

Integral to the economic pressure to export is the toxicity of this equipment. Costs associated with managing known hazards can be avoided if one simply decides to make a buck instead. With the U.S. Government freely allowing this export of toxic waste, there are only matters of conscience for some to contend with. It is precisely because of the economic incentives to do the wrong thing that nations came together in the 1980's to erect a trade barrier to hazardous wastes (the Basel Convention and the Basel Ban Amendment). The United States remains the only developed nation to disregard this landmark treaty, and to continue to dump its hazardous waste on any country it wants.

Question 4. What level of oversight exists at the state or federal level to monitor and enforce protections for public health and environmental quality at overseas recycling facilities that take domestically generated e-waste?

Response. None. U.S. State and Federal agencies have no extraterritorial jurisdiction whatsoever. Without this authority, it is impossible to claim that proper monitoring and enforcement can take place. The oversight is reduced to an honor system which is not adequate to ensure standards are upheld.

As we continually must stress, with weaker economies, one cannot expect that the infrastructure will exist to protect the environment, workers and communities, from the impacts of hazardous wastes. Even if they did actually have the same infrastructure as developing countries, it is still inappropriate to burden weaker economies with disproportionate amounts of hazardous wastes or other environmental problems simply because they are relatively poor. This is the type of behavior which gives globalization it reputation as being exploitive.

Rather than looking for ways to put band-aids on the disastrous e-waste export situation it is far better to work toward establishing national recycling infrastructure and providing support for it by promoting mandated recycling paid for by producers.

The OECD treaty, however, attempts to address this issue by allowing OECD member countries to keep their hazardous waste within those 30 developed countries, using only environmentally sound management systems (EMS) for the hazardous wastes. The United States, an OECD member country, has the legal right to ship its hazardous waste to other OECD countries, if it meets the minimal requirements for prior informed consent, EMS facilities, etc.

To this end, the OECD has developed the "Technical Guidance for the Environmentally Sound Management of Specific Waste Streams: Used and Scrap Personal Computers" This document is a set of guidelines, not requirements, that was created for and by the 30 OECD member countries, and only for use within the OECD. It is not intended as a guidance to justify exports to non-OECD countries. Therefore, any system set up in the United States should never suggest that OECD Guidelines be met in non-OECD countries.

Question 3a. What is the best way to encourage the least amount of hazardous substances in electronic products and the largest amount of recycling?

Response. Costs of management must be internalized so that those that profit from the use of consumer products (both the manufacturers and the consumers) bear the entire costs of the products' liabilities presented through its entire life cycle. This type of feedback mechanism ensures incentives for greener and greener design. Proper mechanisms that provide for consumer and producer responsibility must be promoted through legislation. It is not appropriate to allow mechanisms that externalize costs to taxpayers, city or local governments, utility rate payers, prison labor forces, or offshore communities.

The EU passed the RoHS Directive (Reduction of Hazardous Substances) listing six specific materials that must be removed from new products by July 2006. Companies are redesigning their products to remove these materials, rather than be left out of those markets. The United States will presumably benefit from Europe's efforts, if these redesigned products are also available to U.S. markets. The RoHS list of substances is only a preliminary list, and there are other materials that require attention, but it's an excellent example of how chemical policy can force change in design. It would be easier and cheaper to recycle electronics products if they were not so toxic. So reducing the toxic materials, along with setting up an effective recycling infrastructure, is the best way to increase recycling

Question 3b. E-waste contains a number of heavy metals and other hazardous substances that can threaten public health, especially vulnerable populations. Lead is one such metal in abundance in e-waste. What is the state of knowledge regarding the safety of current standards for protecting children from lead exposure?

Response. Actually with every year that passes, scientific research shows that lead is even more of a problem for childhood development than previously thought. For the last 2 years, the EPA has been readying a new lead level thresholds. It is likely however that no amount of lead exposure is truly safe. The impacts on children can be devastating, leaving irreparable damage to nervous system and brain development. The notion that lead somehow disappears once placed in a landfill is very shortsighted thinking. If we believe in the survival of the human species, we must think of very long-term leaching and exposure. Heavy metals are immortal—they don't have a half-life. They are with us forever. The ultimate answer for lead, mercury and other toxic metals is to rapidly provide incentives to design our way away from their continued use. This is best done through mandated extended producer responsibility and toxic use phase-outs.

Note: The Computer TakeBack Campaign would like to mention the contributions by our partner organization, the Basel Action Network, in supplying answers to some of the recycling questions.

STATEMENT OF MICHAEL VITELLI, SENIOR VICE PRESIDENT, BEST BUY ON BEHALF OF THE CONSUMER ELECTRONICS RETAILERS COALITION (CERC)

Chairman Thune, Ranking Member Boxer and members of the Committee, I am Michael Vitelli, Senior Vice President of Consumer Electronics of Best Buy and am here today on behalf of the Consumer Electronics Retailers Coalition (CERC) to provide the views of CERC's membership on the need for a national electronics management system.

CERC very much appreciates the opportunity to provide the views of the consumer electronic and general retail industry concerning the need for a national approach to handling electronic devices at their end of life. We are also very appreciative, Mr. Chairman, of the leadership you have shown in holding this hearing today and providing a forum for interested stakeholders to express their views. We look forward to working with you and the members of this Committee to identify the best means of developing a national solution for electronic device recycling that will, obviously, have to be implemented at the local level.

INTRODUCTION

Best Buy is the country's leading consumer electronics retailer with close to 700 stores in 49 of the 50 states and nearly 100,000 employees. The company started in 1966 with a single store in St. Paul, Minnesota and we continue to operate our headquarters in the Twin Cities.

In addition to our product and service offerings, Best Buy is also known for our commitment to our communities, providing volunteer support, financial resources and leadership on many issues, but especially on the use of innovative technology to improve the learning opportunities for kids. We provide over 1300 scholarships to students entering higher education—3 scholarships in every Congressional district in the country. Our new tech program rewards schools and educators who are using technology to energize their lesson plans and engage students. The National

Parks Foundation's Junior Ranger program is available to kids across the country through the Web Ranger program sponsored by Best Buy. With Junior Achievement's "Titan" business simulation game, we've helped harness the excitement of a video game to stimulate real learning.

Best Buy has also been actively concerned with the issue of electronic waste. In 2001, we launched a series of recycling events to provide a simple, fun and convenient program for recycling electronics that protects the environment while raising awareness of recycling options. Best Buy has helped consumers nation-wide recycle over 2.5 million pounds of electronics in an environmentally responsible way since the program began. In addition to recycling events, we also offer the ability to recycle cell phones, ink cartridges, and rechargeable batteries year round in all our U.S. stores.

CERC is a national coalition representing small, medium and large consumer electronics retail businesses and associations that operate in all 50 states and worldwide. Our members, in addition to Best Buy, include Circuit City, RadioShack, Wal-Mart, Target, the North American Retail Dealers Association and the Retail Industry Leaders Association. Our goal is to educate, advocate and instill continued consumer and market confidence in consumer electronics policy issues.

Consumer electronics (CE) retailers throughout the United States strongly believe that developing an electronics management system that encourages the collection and recycling of electronic waste is far more preferable, desirable and efficient if it is handled as a federal solution implemented by local authorities, rather than dealing with a patchwork of different eWaste laws instituted by individual States. In the first half of 2005 alone, 30 State and local legislatures saw more than 50 separate bills introduced on this issue including an eWaste measure introduced and still active in New York City. A 50-by-50 approach is administratively unreasonable and infeasible for manufacturers and retailers alike and will not lead to a comprehensive and efficient electronics waste management system for our Nation.

Retailers have a limited role in the life cycle of the products we sell. We neither design nor make the products, nor do we have control over what a consumer does once the product is purchased, and have no control on a products reuse, recycling or disposal. However, CE retailers realize that we have a responsibility in working with all the interested stakeholders. Retailers, manufacturers, distributors, recyclers, public interest groups, charitable organizations, state and local governments, and our customers all have a role in advocating for the development of a successful national electronics waste management system.

Both CE and general retailers unanimously support a shared responsibility approach to the handling of electronic devices at the end of their life cycle. Product stewardship addresses the environmental impact of electronic products at all stages of their life cycle—from design and manufacturing to packaging and distribution to end-of-life management. When done correctly and fairly, it shifts the responsibility for end-of-life management from the public sector (government and taxpayers) alone, to a shared responsibility that includes the private sector (manufacturers, recyclers, non-profits, retailers and purchasers). The goal is to encourage environmentally-friendly design and recycling and reduce flow to the landfills.

Following months of internal discussion, conducting an industry-wide survey, holding meetings with state legislative leaders and experiencing the impact and initial results of the California advance recycling fee law, CERC drafted a consensus legislative position paper on electronic waste management earlier this year, which is attached to my written statement. While other stakeholders have yet to reach a broad consensus, consumer electronic and general retailers, including their national and state federations, have come together around a position that we believe succinctly and forthrightly lays out the issues, opportunities and obstacles involved in setting up a nationwide eWaste model. Since issuing this Position Paper, CERC has been working with and recruiting broad cross-industry support among other interested stakeholders, including environmental groups, recyclers, state legislators and manufacturers.

While retailers and many others believe that the producer responsibility approach is the most fair, least burdensome, and most easily manageable model, we have also looked upon the Talent-Wyden bill (S 510) that would provide a limited tax credit to recyclers as an excellent conceptual model that could jump-start a national capitalization of eWaste recycling.

While we have expressed general support for some state initiatives, such as laws recently passed in Maine and Maryland; and opposition to others, such as the point of sale advance recycling fee recently instituted in California; our purpose in testifying today is not on which state law is good or bad, efficient or administratively burdensome, helpful or hurtful to eWaste recycling efforts. Rather, we are here to

advocate for a national approach and to highlight some very successful voluntary efforts that industry partners have been engaging in.

CURRENT PROGRAMS/ACTIVITIES

Even without state or federal laws governing management of electronic waste, the private sector—manufacturers and retailers working with qualified recyclers—has been fully supportive of the shared responsibility product stewardship approach through numerous voluntary initiatives that collect and recycle devices. These programs have included the development of a strong and meaningful educational campaign for consumers and policy makers. Best Buy and other members of CERC, as well as consumer electronic retailers that are not members of our organization, together with a number of manufacturers, have been actively involved in activities that highlight the need for conservation and how best to handle electronic devices at their end of life.

There are several initiatives in place today to reduce and manage electronic waste both at the federal and industry levels. CERC members and other consumer electronic retailers and manufacturers have participated in such EPA programs as the Plug-In To eCycling outreach campaign, which works to increase the number of electronic devices collected and safely recycled in the United States and has identified new and creative flexible, yet more protective ways to conserve our valuable resources.

Plug-In To eCycling focuses on:

• Providing the public with information about electronics recycling and increasing opportunities to safely recycle old electronics;

• Facilitating partnerships with communities, electronics retailers and manufacturers to promote shared responsibility for safe electronics recycling; and

• Establishing pilot projects to test innovative approaches to safe electronics recycling.

Program partners have included manufacturers like Panasonic, Sharp, Sony, JVC, Lexmark, Dell, Intel; retailers like our company, Best Buy, as well as Staples and Office Depot; and approximately two dozen state and local governments. More than 26.4 million pounds of electronics were collected in the first ten months of this national program alone.

In addition to the Plug-In To eCycling campaign a number of retailers and manufacturers have taken part in voluntary programs to encourage greater recycling.

As noted in my introduction, Best Buy actively provides recycling options for our customers with our recycling events. We have had an overwhelming response to our events. In fact, the event we hosted a month ago at our corporate headquarters in Minnesota drew record crowds with over 2,900 cars and a collection of over 250,000 pounds (125 tons) in just two days. This is in a county that already has a program in place for the recycling of electronics. Our next event is scheduled for our Mira Mesa, CA Best Buy store (9540 Mira Mesa Blvd, San Diego, CA) on Friday, August 5th and Saturday, August 6th from 10:00 a.m. to 5:00 p.m. We are very excited to be partnering with HP and Sony at this event.

In another example, six of our Best Buy stores in the Indianapolis area served as recycling drop-off points for many consumer electronics items in a 2004 pilot. Accepted items included computers, monitors, printers, fax machines, televisions, stereos, VCRs, DVD payers and camcorders.

In addition to Best Buy activities, a number of CE retailers and manufacturers have and are taking part in voluntary pilot projects. Staples, for example, sponsored a New England-based pilot program in cooperation with EPA's Plug-In To eCycling campaign and the Product Stewardship Institute (PSI) in the summer of 2004. Also last summer, Office Depot and HP sponsored a similar in-store electronics recycling pilot nationwide. Both programs accepted hardware from any manufacturer, including PCs, mice, keyboards, PDAs, monitors, flat-panel displays, laser and ink jet printers, scanners, all-in-one printers, digital cameras, fax machines, cell phones, TVs, and TV/VCR combos. This summer, Good Guys is partnering with the EPA and a number of electronics manufacturers to collect and recycle televisions.

A NATIONAL ELECTRONICS MANAGEMENT SYSTEM

But we all realize that voluntary programs cannot fully handle or solve the end of life issues surrounding electronics products. CERC strongly believes a comprehensive nationwide approach to the management of electronics is the ultimate solution. We further believe that a successful national system can be established without imposing fees at the point-of-sale; without having to create a new complex administrative structure; and without mandates that discourage innovation. This is why the Talent-Wyden "Electronic Waste Recycling Promotion and Consumer Protection Act"

(S 510) seems to many of us as a cost-efficient and potentially successful national approach. We urge you and your colleagues to look at this end of life tax credit as a viable and creative opportunity to deal with electronics at their end of life.

However, in the alternative, retailers support a no-fee producer responsibility system because it will provide consumers with a variety of choices and manufacturers with flexibility to implement electronics recycling programs that make sense—to our customers, government, retailers and manufacturers.

Our Position Paper outlines the factors and components that a successful producer responsibility program should include:

- Initially, any program should have a limited number of types included to insure an easy transition, and clear definitions of which devices are covered.
- Making sure that any 'take-back' programs—if mentioned at all—remain voluntary.
- A 'safe harbor' for a consumer electronics retailer that sells a product not covered under an approved management plan absent actual knowledge.
- Programs that help educate and are easily understood by consumers.
- A flexible system that allows manufacturers the ability to provide services to consumers and encourages the market to drive efficiencies and choices.
- Encouragement to voluntary collection initiatives by manufacturers to partner with retailers, charities and/or local government.
- Establishment of manufacturers' financial responsibility based on the products that consumers return to the system—not fees at the point of sale or other financial models that do not reflect the true costs and realities of the return system.
- The ability of manufacturers to work independently or collaborate with others to meet the established responsibility goals.

Our members oppose a point of sale advance recovery fee (POSARF) system because we know from firsthand experience that such an ARF will not accomplish its goals, is administratively burdensome for all parties, and will only guarantee a new revenue source for government without guaranteeing that an effective recycling system will be put into place. In addition, such a program provides no incentive for the design of more environmentally-friendly products, and fails to take advantage of market forces to reduce the cost of recycling over time.

The recent institution of such a fee/tax program in California has already been shown to be:

- Too complicated for all parties—government, businesses and consumers—to understand and administer.
- Incredibly costly for both governmental agencies and retailers to implement.
- Impracticable to bring sufficient dollars down to the local level to implement enough local collection and disposal facilities.
- Impossible to impose on out-of-state online/mail order retailers.
- Impractical, by asking the government to set up a new administrative structure to collect the fees, to manage the program and disperse the revenue for effective recycling.
- Impossible to know how high the taxes/fees charged to consumers needs to be in order to adequately fund a successful electronics device recycling program.

In short, a POSARF—particularly given significant budget cutting at all levels of government—will not adequately fund an effective recycling program, and will only serve to confuse and burden the consumer with the imposition of new fees and perceived new taxes without any direct benefits.

CONCLUSION

The members of the Consumer Electronics Retailers Coalition, together with CE and general retailers and their trade associations throughout the United States, want to be constructive and contributing partners with law makers, manufacturers, public interest groups, recyclers and our customers in dealing with the end of life issues surrounding electronics products. We cannot, however, afford to let individual states and certainly individual cities and counties, establish their own programs that impose inconsistent mandates on retailers or manufacturers.

We very much appreciate the holding of this hearing and encourage Congress in general and this Senate Committee in particular to continue to work towards a national solution to electronics waste management. We pledge to work with you in arriving at a fair, viable and effective approach.

Thank you.

Consumer Electronics Retailers Coalition

CERC

www.ceretailers.org

Consumer Electronics Retailers Coalition (CERC) Position on the Need for a National Electronics Management System

- Consumer electronics (CE) retailers strongly believe that developing a national electronics management system that effectively encourages the collection and recycling of electronic waste is far more preferable if handled as a "federal solution" rather than by individual states.
- CE retailers realize that they have an important role in working with and being active participants with other interested stakeholders in developing a successful federal model that will have to be implemented at the local level.
- CE retailers believe a successful national system for electronics recycling can be established without imposing fees at the point-of-sale; without having to create a new complex administrative structure; and without mandates that discourage innovation.
- CE retailers believe that a no-fee system will not only continue to encourage innovation, but will also provide consumers with a variety of choices and manufacturers with flexibility to implement electronics recycling programs that make sense – to consumers, government, retailers and manufacturers.
- CE retailers also believe that the U.S. can learn from and build on the lessons of other countries that have implemented recycling programs. Our nation has a unique opportunity to create a progressive producer responsibility system that encourages the market to drive an effective, efficient and environmentally sound solution.

Federal Legislation – A comprehensive nationwide approach to the financing, collection, transportation and recycling of electronic devices that preempts individual state action is ultimately the best solution for all parties – manufacturers, distributors, retailers, collection agencies, recyclers, governments at all levels and consumers.

- Consumer electronic retailers view the implementation of the ***Producer Responsibility*** model as the most efficient and comprehensive electronics waste management plan. Such an approach will encourage effective recycling while, at the same time, be the least burdensome to the consumer. In order to be successful, however, the ***Producer Responsibility*** approach must include –
  - A **limited number of types** and **clear definition** of covered devices.
  - That any **retailer 'take-back' programs** – if mentioned at all – must remain **voluntary**.
  - A **'safe harbor'** for a consumer electronics retailer that sells a product not covered under an approved management plan absent actual knowledge.
  - Programs that help **educate** and are easily understood by **consumers**.
  - A **flexible system** that allows manufacturers the ability to provide services to consumers and encourages the market to drive efficiencies and choices.
  - Encouraging **voluntary collection initiatives** by manufacturers to partner with retailers, charities and/or local governments.
  - Establishing manufacturers' **financial responsibility based on the products that consumers return to the system** – not fees at the point-of-sale or other financial models that do not reflect the true costs and realities of the return system.
  - The ability of **manufacturers to work independently or collaborate with others** to meet the established responsibility goals.

State Action – Though a successful electronic waste management solution must be nationwide in scope, CE retailers, in coalition with other interested stakeholders, will actively work with states that remain desirous of moving their own legislative solution as a transitional step to the implementation of a nationwide system – focusing their attention on the ***Producer Responsibility*** model. If a state does move such legislation, it should recognize the need to include certain key principles –

- A **sunset provision** that allows for federal preemption in the event that Congress passes a national electronic device recycling law.
- Provisions that **include all means by which a covered device is sold for retail** in the state – whether sold in-store, by telephone or over the Internet.

For practical and administrative reasons, a **nationwide** *PRODUCER RESPONSIBILITY* **approach is the most efficient and optimal answer** because it will –

- Place responsibility for the effective recycling of electronic devices where it belongs – on those stakeholders, including producers, distributors, retailers and consumers, who benefit from the sale of electronic products.
- Encourage producers to design products for ease of recycling, and could encourage manufacturers to design products with less materials of concern, if laws are designed to exempt those products that are safe for landfills.
- Establish a system that – unlike the point-of-sale advance recovery fee approach instituted in California – is easy to administer, is not complicated, is inexpensive for consumers, retailers and governments, and does not unfairly burden the residents of one state.
- Provide a level playing field that applies to all types of sale at the state level – whether the covered consumer electronic product is sold via the Internet, catalogue, over the telephone, or in a traditional brick-and-mortar/in-store operation.

THE POINT-OF-SALE|ADVANCE RECOVERY FEE APPROACH WILL NOT WORK

Consumer electronic retailers oppose any "point-of-sale|advance recovery fee" (POS|ARF) approach because such an approach has been shown to not accomplish its goals; is administratively burdensome for all parties; and will only guarantee a new revenue source for government without guaranteeing that an effective recycling system will be put into place.

The recent institution of such a fee/tax program in California has already been shown to be:

- Too complicated for all parties – government, businesses and consumers – to understand and administer;
- Incredibly costly for both the governmental agencies and retailers to implement;
- Impracticable to bring sufficient dollars down to the local level to implement enough local collection and disposal facilities;
- Impossible to impose on out-of-state online/mail order retailers;
- Impractical, by asking the government to set up a new administrative structure to collect the fees, manage the program and disperse the revenue for effective recycling; and
- Impossible to know how high the taxes/fees charged to consumers needs to be in order to adequately fund a successfully electronics device recycling program.

In short, a POS|ARF approach – particularly given significant budget cutting at all levels of government – will not adequately fund an effective recycling program, and will only serve to confuse and burden the consumer with the imposition of new fees and perceived new taxes without any direct benefits.

RESPONSE BY MICHAEL VITELLI TO AN ADDITIONAL QUESTION FROM SENATOR INHOFE

Question. In 2003 California passed the Electronic Waste Recovery Act which established a funding mechanism to provide for the recycling of certain electronic products. The goal was to eliminate these items from public landfills and provide an easy and convenient method of proper management. The system is funded through fees paid by consumers of covered electronics products at the time of purchase. The projected revenue for the first year was $60 million, and $15 million have already been collected. In addition, more than 13 million pounds of materials have been recovered for recycling in the first quarter alone.

How much is compliance with the California system costing retailers?

Response. Best Buy has spent nearly $1 million in California to update our point-of-sale systems, to educate our store personnel and consumers, and to ensure compliance going forward. Since these point-of-sale fees are not added to all products, like a sales tax often is, but rather added to only some products (and not even all products in a given category of products,) the cost of compliance is high. In addition, each time changes are made to the fees and to the list of applicable products, these systems must be updated, adding costs. Finally, if different states implement differing schedules of fees, the costs of compliance will increase.

RESPONSES BY MICHAEL VITELLI TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Mr. Vitelli, in your testimony, you advocate "a shared responsibility approach." Please explain how such a system would work. In particular, please delineate the relative responsibilities of manufacturers, retailers, consumers, and recyclers under such a shared responsibility approach?

Response. In the manufacturer responsibility model, manufacturers are responsible for working with consumers to properly recycle their product. This can mean that they provide direct recycling, work with a recycler or in some instances, fund a recycling system. Retailers are responsible for the education and outreach of consumers, working with manufacturers to ensure that they are carrying product from manufacturers who are compliant with the law. Retailers are also responsible as a manufacturer; if they produce private label brand products (Best Buy brands include Insignia and Dynex.) Consumers are responsible for the proper disposal of products and recyclers must meet environmentally sound practices when working with consumers and manufacturers.

Question 2. If the recycling of electronic waste were profitable, more businesses would be doing it and waste disposal would not be as big a problem. In your opinion, what are the economic barriers to making recycling of electronic waste economically viable?

Response. One of the driving reasons this issue requires government action is that the recycling of electronic waste will probably always cost more than value of the residual scrap. Thus a system that provides an incentive to reduce the costs of recycling through design of the product has the greatest potential to ultimately provide the least cost solution to this issue.

A complicating factor is that there is currently a significant amount of historic waste waiting for a solution. These products were manufactured without the expectation that they would need to be recycled. This adds a "hurdle" of initial cost to any new system. If the issue of historic waste could be handled through a different program than the ultimate, ongoing program, the solutions might be easier to achieve. The Talent-Wyden approach provides a significant incentive to tackle this initial cost "hurdle" and could help start a recycling process that ultimately does not need the incentives provided through the Talent-Wyden approach.

Question 3. What are the consequences for your industry if Congress fails to enact national electronic waste legislation?

Response. The Consumer Electronic Retailers Coalition represents small, medium and large consumer electronics retail business in all 50 states and worldwide. In 2005, 30 states contemplated 50 different pieces of legislation. Ultimate passage of differing solutions in each of the 50 states would present real compliance challenges and costs. In addition, differing solutions in each of the 50 states will cause great confusion for consumers. Products purchased in one state with a fee added at the time of sale, may need to be recycled in another state where the solution may be a charge at the time of recycling.

RESPONSES BY MICHAEL VITELLI TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. The Consumer Electronics Retailers Coalition supports a national electronics recycling system based on making manufacturers responsibility for recycling electronic waste. What are the biggest advantages and disadvantages to this type of recycling system?

Response. In the manufacturer responsibility model, manufacturers are responsible for working with consumers to properly recycle their product. This can mean that they provide direct recycling, work with a recycler or in some instances, or fund a recycling system. Under the manufacturer responsibility model, the manufacturer is ultimately responsible for their product at end-of-life which provides the double incentive to both develop environmentally-friendly products and to find the most cost effective ways to recycle product. Ultimately consumers will pay for recycling through either higher taxes, fees at the time of purchase, or additional costs included in the cost of the product by the manufacturer. Only the latter offers an economic incentive for improvements.

Question 2. Best Buy has been a leader in several, highly-successful voluntary efforts to recycle waste from electronic products. Do you think that these voluntary initiatives can solve our problems with recycling electronic waste, or is more needed?

Response. Best Buy's voluntary recycling events only provide a small solution to a much larger need. More industry leaders would need to join this effort in order for it to be effective at addressing the problem. The Talent-Wyden (S–510) could provide an incentive for industry to take that added step.

Question 3. What are the two or three best things that the federal government can do to increase the rate of recycling to both promote environmental stewardship and help businesses make profits?

Response. The Talent-Wyden bill provides a good incentive to help businesses grow their recycling efforts. It also provides a solution to the issue of historic waste, which is a complicating and costly portion of the total solution. By giving manufacturers and/or retailers a tax credit to run recycling programs, it not only can help to create more of a base for programs, it allows manufacturers to realize their true costs in recycling and can help motivate manufacturers to design more environmentally-friendly products, ultimately reducing their recycling costs.

In addition, the Federal Government could actively study this issue, thereby providing assurance to states that a federal solution may be found and potentially reducing the number of individual state actions. Many states are acting only because they do not see a federal action.

STATEMENT OF SCOTT SLESINGER, VICE PRESIDENT FOR GOVERNMENTAL AFFAIRS, THE ENVIRONMENTAL TECHNOLOGY COUNCIL

My name is Scott Slesinger. I am Vice-President for Governmental Affairs of the Environmental Technology Council. I want to thank the Committee for requesting for the views of our Council on the issue of electronic or e-waste. Our council represents environmental service companies that recycle hazardous materials including electronic wastes and solvents. We also represent hazardous waste facilities permitted under the Resource Conservation and Recovery Act.

The volume of e-waste is growing, now comprising about 2 million tons a year. But this is a small percentage of the 236 million tons of waste that is disposed in our nation's sanitary landfills. The reason that e-waste is a problem is the composition of the waste—electronic wastes such as television screens, computer screens and cell phones contain toxic materials including mercury, cadmium and lead.

CHALLENGE OF E-WASTE

Despite public statements to the contrary the amount of lead in a cathode ray tube (CRT) is not a "trace amount."[1] Similar to the lead shielding used to protect dental patients during x-rays, the amount of lead in computer is significant. A CRT can easily contain over 10 pounds of lead; large televisions have significantly more. The lead is a critical component that protects the users from radiation emitting from the tube. Other parts of the computer use lead in solder. Without these toxic metals, disposal in a sanitary landfill would be a safe and available option. However, sanitary landfills contain mostly organic food and other biodegradable acetic waste.

[1] Gattuso, *Washington Post*, June 19, 2005, page B8. Attachment B. Response published in *Washington Post* July 2, 2005 Page A27, Attachment A.

These facilities are not operated to protect the environment from the leaching of the volume and types of lead that would be placed in such facilities. Newer, flat panel monitors do not use leaded glass, but require another toxic chemical, mercury, to operate efficiently.

If computers are hazardous toxic wastes under the law, why are they being disposed in non-hazardous waste landfills? When Congress passed the hazardous waste law, Congress exempted households and certain small quantity generators from the hazardous waste regulatory regime. The belief at the time was that the volume of toxic wastes from households and small generators would be minor and therefore would not be a threat to the environment.

RESPONSE TO THE E-WASTE PROBLEM

When communities became aware of the volumes of lead being placed in their sanitary landfills, they grew concerned. Some communities passed laws to encourage recycling and alternative waste management activities. Some banned such waste from landfills; others supported e-waste recycling.

About a quarter of the states passed laws treating CRTs as universal wastes. The universal waste rules are clear and simple standards for managing widely distributed hazardous wastes where the full hazardous waste requirements would be overly burdensome. The intent of the universal waste rules is to get hazardous waste out of the sanitary waste stream but without the rigorous requirements protections intended for industrial process wastes at factories and similar facilities. Essentially, the universal waste rules are a middle-ground between the household and conditional exempt generator rules, which exempts waste from controls and the full RCRA Subtitle C hazardous waste rules. EPA has established universal waste rules for items such as mercury thermostats, spent lead-acid batteries, unused pesticides, mercury thermostats and fluorescent lamps. An EPA advisory group that included state, Federal, and environmental and industry representatives[2] recommended to EPA that CRTs be added to the universal waste program to ensure responsible recycling. However, we have learned that instead of requiring universal waste protections, EPA plans to finalize regulations that essentially deregulate these wastes if sent to domestic recyclers. EPA's proposed exemption from RCRA for CRT glass, if followed by the states, would represent a regrettable rollback in environmental protection.

The universal waste requirements that some states have in place for computers and CRTs provide for proper packaging, labeling, and tracking of shipments of CRTs sent and received to prevent illegal dumping and ensure legitimate recycling. The requirements also include notifying state regulatory officials of CRT waste management activities to allow necessary inspections and compliance. These requirements are appropriate and not unduly burdensome for companies engaged in the commercial collection, processing, and recycling of this type of hazardous waste. The practical and sensible approach is for EPA to apply universal waste standards to all CRT glass destined for recycling at the point of commercial collection. Other electronic waste, including computer hardware and cell phones should likewise be regulated under universal waste rules. The universal waste rules were promulgated for just this type of waste. Those who may argue that deregulation will lead to more recycling may be right. But such unregulated recycling will inevitably lead to improper recycling, taxpayer financed cleanups and public cynicism of recycling. These costs will dwarf the benefits of the possible chance of some increased recycling.

The risks are not imaginary. At the State Hazardous Waste Conference in 2002, many state regulators described the recycling industry as a "low-profit, risky business" with high turnover rates and inadequate insurance. The state regulators cited cases where low cost recyclers were merely sham operations that collected wastes fees, with no intention of doing any recycling. Many of these facilities have since gone out of business leaving contaminated sites for state agencies to clean up. One example occurred in Phelps County, MO. According to media reports,[3] The Missouri Department of Revenue found 15,000 abandoned computer monitors. The DNR found someone was running a "computer recycling" business out of a rented building on the property. The owner of the business reportedly told customers he would take the monitors and dispose of them properly. Instead, state investigators say the man took the monitors, the cash and left. Hot sun melted the plastic coverings and rain can cause the lead to run-off into the soil and groundwater. It cost Missouri taxpayers hundreds of thousands of dollars to clean up the mess. By proposing to ex-

[2] The Common Sense Initiative (CSI) Council Computer and Electronics Sector Subcommittee 67 FR 40,515 col.1.

[3] KOLR–TV, Springfield, MO. *www.recycles.org/124226366.htm*

clude CRT glass recycling from RCRA and the universal waste rule, EPA would be aiding and abetting this problem.

Despite EPA's approach, many generators of computer wastes want recyclers to have some "Good Housekeeping" seal of approval. EPA responded by establishing fairly good guidelines in the document Plug-In to eCycling Guidelines for Materials Management. However, these Guidelines are only voluntary and their effectiveness as opposed to a promulgated universal waste standard is unconvincing.

ECONOMICS OF RECYCLING

The key to e-waste recycling is economics. The first choice for the handling of e-waste, and the most economically viable alternative, is reuse of complete systems or individual components removed from the computer systems. Unfortunately, this alternative is not sufficient to accommodate the entire quantity of e-waste generated. Although donation programs are a means of providing technology to those that may not be able to afford it, there is a potential downside to this practice. If a company donates usable but outdated equipment to a school or program for low income individuals, the service life of that equipment is much shorter than that of new equipment. As such, the organization that could not afford to purchase new equipment is saddled with the cost of disposing the donated items when they cease operating. We know of one instance where a school received donated computer systems only to find that greater than 50 percent of the monitors received ceased operating within the first year.

For those items which cannot be reused, the other alternative is to recycle e-waste. Recycling will pay for itself if the value of the commodities that can be harvested from the computer is greater than the cost associated with the labor and facilities necessary to safely separate the materials into recoverable assets. If the economics don't work, recycling can still occur if someone—the consumer, government, or manufacturers pays for the recycling. Today, recyclers cost to recycle computers has dropped as commodity prices and useable parts prices have increased.

There are several variables that work against a vibrant domestic e-waste recycling industry. The first is the availability of "glass to glass" recycling. As domestic manufacturers have moved operations overseas or discontinued the manufacture of CRT glass, the demand for leaded glass within the United States has dropped. When EPA proposed its CRT rule in June of 2002, the Agency determined that the value of leaded glass waste was $170 a ton. By January 2004, the value was minus $200. This economic reality created a situation where leaded glass was cheaper to dispose than to recycle. It also undermined EPA's rationale in its proposed CRT rule that defined broken leaded glass as "commodity" because of its value. There is now a strong demand for CRT glass in Brazil and China for use in computers and televisions in those countries. However, the ultimate disposal of those CRTs after their second life is unlikely to be protective of the environment. A related factor is the price of metals on the commodities market. Most commodities do not go up with inflation as we see with the price of real estate or beer. Instead prices fluctuate wildly based on worldwide demand. When prices are high, inevitably there is more mining, recycling and use of alternatives followed by over-supply and price declines. The price of lead has fluctuated dramatically over the years. (Attachment C) Therefore any subsidy system should be flexible to accommodate the fluctuating prices of the metals and re-usable parts of e-waste.

Another factor is the cost of the recycling activity. It is difficult for e-waste recyclers located in the United States to compete with other low cost foreign recyclers. Because the recycling of e-waste is so labor intensive, the low wages and lack of benefits paid in some foreign countries provide these recyclers with disproportionately lower processing cost. Processing costs are not just limited to labor costs but also include the costs associated with environmental compliance and providing for worker safety. Many of these recyclers are located in countries that do not have the same level of standards that exist within the United States. The Basel Action Network report on China highlights the problems that exist. To address the labor costs, a few states have turned to prison labor; however this has been controversial due to questions concerning worker protection and other health and safety standards.

Many of our customers send computers to us for handling because our companies are heavily regulated. They know by our reputation and regular audits that we are in compliance with RCRA and state laws. For instance, we must track our waste, train our employees, prepare spill prevention plans and hold environmental insurance and closure insurance. Under the EPA proposed CRT rule, our competitors would not need to meet any of those requirements. Those companies would be subject to RCRA if they spilled hazardous waste on the ground but it is hard to imagine

how that would be known. It would be difficult, if not impossible, for regulated entities to compete in such a system.

Our companies also have policies in place which mandate appropriate due diligence is exercised in selecting proper facilities for the recycling or disposal of materials derived from e-waste, regardless of whether the company is located domestically or abroad. These customers want to be assured that the wastes will actually be recycled properly and that the wastes from the recycling process, if any, are handled safely and consistent with the law.

Today, with commodities prices high, there have been many new businesses trying to make profits out of e-waste. When the price of the valuable components inevitably turns, these unregulated recyclers may fail and leave the taxpayer to clean up the toxic remains. We believe that whatever legal regime is established for recycling the rules should require financial assurance for closure, environmental liability insurance, employee training and some minimal waste tracking so consumers can be assured their discarded computers are managed properly.

The Wyden-Talent bill, which we endorse, includes standards for e-waste recyclers. With protections and economic incentives, we believe e-waste recycling can expand and be a significant part of the manufacturing life cycle. Mr. Chairman, the goal should not simply be to increase recycling. The goal should be responsible recycling that conserves sources, saves energy and enhances the environment.

Thank you and I look forward to answering any questions you may have.

ATTACHMENT A

The Washington Post

Sham Science Debunked; [FINAL Edition]

The Washington Post. Washington, D.C.: Jul 2, 2005. pg. A.27

Full Text (303 words)

No sooner does Ellen Goodman [op-ed, June 18] decry the way industry-funded think tanks misrepresent science than your paper proves the point by printing a column from the Competitive Enterprise Institute attacking Maryland's computer recycling law [Close to Home, June 19].

Computer and TV screens use lead to protect the user from radiation. But once these electronic products become waste, the lead can pose serious health effects, such as reduced intelligence and attention span. It can cause learning disabilities and damage a child's brain and nervous system.

The Competitive Enterprise Institute asserts that there is no evidence that computers in landfills will leak lead into our soil and drinking water. Not true. The article cites the acknowledged scientific expert in the field, Timothy Townsend, to turn his research upside down. Townsend's research proved that computer monitors fail the Environmental Protection Agency's test for toxic waste. The EPA test replicates in a short time what happens in a sanitary landfill over the long term. It often takes years for toxic contaminants to leach from a landfill into the groundwater, so the EPA uses a proven scientific test for this hazard. If a particular waste fails the test, it must be safely recycled or disposed of in an EPA-approved manner. Contrary to the article, Townsend has not concluded that there is no compelling evidence that e-waste can safely be disposed in landfills, which is precisely why he continues his research.

Maryland's new law is a good solution to handle the problem of electronic waste. The law may not b perfect, but whatever states do to address this problem should not have to stand up to challenges based on misrepresentations of the existing science.

-- Scott Slesinger

Washington

The writer represents the hazardous waste recycling and disposal industry as vice president of the Environmental Technology Council.

ATTACHMENT B

This Law Does Not Compute; [FINAL Edition]

The Washington Post. Washington, D.C.: Jun 19, 2005. pg. B.08

Maryland's new law that taxes computer manufacturers to fund efforts to recycle "electronic waste" [Business, June 1] penalizes production, imposes a huge monetary burden on businesses, creates unintended environmental costs and benefits no one.

The law levies a $5,000 fee on manufacturers who have produced more than 1,000 desktop or laptop computers on average each year since 2002. But this fee, targeted at the disposal of unwanted computers, won't come close to covering the full costs of recycling e-waste. The International Association of Electronics Recyclers estimates recycling costs at $500 a ton, compared with $40 a ton to dump the e-waste in a landfill. With 60,000 tons of e-waste piling up in Maryland annually, according to state lawmakers, recycling will cost $30 million a year.

At this rate, the state will need 6,000 manufacturers paying the annual fee of $5,000 to break even. State officials so far have identified 200 companies that are covered by the new legislation.

But recycling that is poorly thought out can create unintended consequences. Consider, for example, the contributions to greenhouse gas emissions produced by the recycling and the transportation of e- waste during the collection and pre-recycling phases. These costs might be worthwhile if they promised a noticeable benefit. But lawmakers not only have failed to identify a benefit, they have yet to articulate a problem -- other than 60,000 tons of electronics discarded every year.

It has been charged that personal computers contain toxic substances that seep out of landfills into our soil and drinking water. But we have no evidence of this. Glass in TV and computer monitors, it also has been claimed, contains concentrations of lead. But studies show that the lead and other trace amounts of heavy metals in computer displays are safely contained in landfills. After extensive study on the long-term behavior of e-waste in landfills, Timothy Townsend of the University of Florida concluded that "there is no compelling evidence" that e-waste poses a risk in landfills. Other studies have reached similar conclusions.

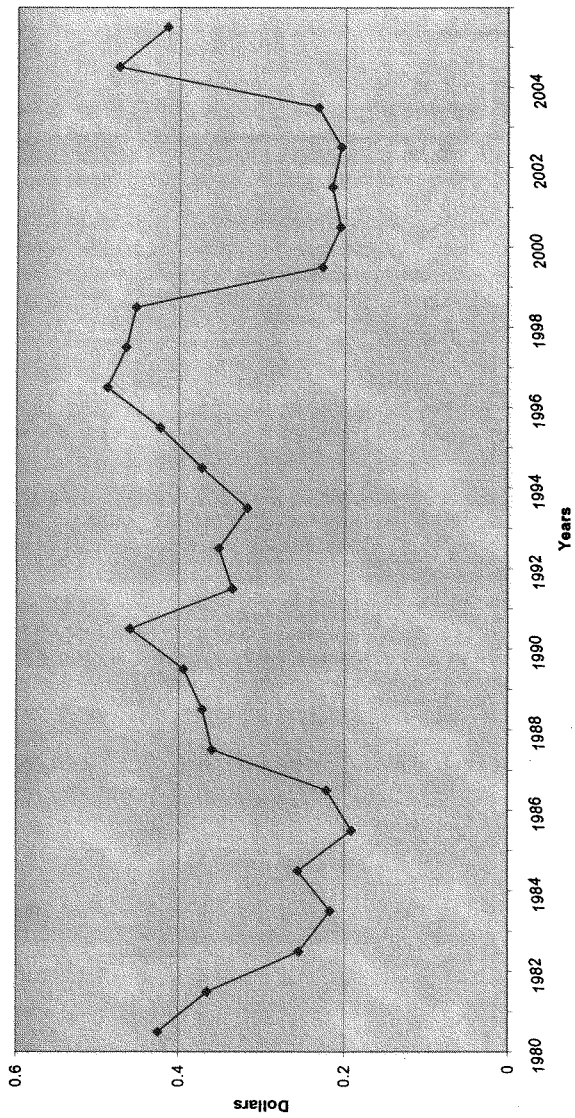
Nationally, the annual number of discarded home computers is expected to peak by the end of the year. That is because consumers tend to hold on to their outdated computers -- recycling 75 percent of them to relatives and friends. This reduces the number of discards that end up in landfills. And while 60,000 tons of e-waste is not inconsequential, our landfills are capable of handling that annual amount for decades to come.

Further, manufacturers voluntarily are taking back and recycling or refurbishing used electronics, and they do it better and cheaper than the government. Last year, producers such as Dell, Hewlett- Packard, Gateway and IBM recycled more than 160 million pounds of e- waste. Such private initiatives have the potential to grow -- but not if state governments burden them with unjustified costs and mandates.

The issue of properly disposing of electronic waste is crucial. We should demand that our lawmakers get it right.

-- Dana Joel Gattuso is an adjunct scholar with the Competitive Enterprise Institute

Attachment C
Annual Average Lead Price
(Dollars per pound)



RESPONSES BY SCOTT SLESINGER TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Mr. Slesinger, you testified that lead and other hazardous substances of concern present in many used electronic products may pose an environmental risk during recycling or disposal if not properly managed. To your knowledge, is EPA conducting any inspections in this area or monitoring the proper handling of electronic waste?

Response. Unlike in the European Union, Canada and Japan, EPA does not regulate most recycling, even when the recyclers are handling hazardous materials. Only companies that recycle hazardous wastes and have permits for storage may be subject to inspections by EPA or a state agency. To the best of my knowledge, EPA is not conducting any inspections or monitoring activities with respect to the proper handling of electronic wastes that are recycled.

Under our environmental laws, states are often allowed to be more protective than the federal government. States such as California, Maine and Washington do regularly inspect recyclers of computers and other hazardous discarded materials.

*Question 2.*If the recycling of electronic waste were profitable, more businesses would be doing it and waste disposal would not be as big a problem. In your opinion, what are the economic barriers to making recycling of electronic waste economically viable?

Response. Generally, it costs more to recycle than dispose of electronic wastes. Unless companies and homeowners with old computers are willing to pay to have them recycled, an industry will not exist to serve a need not in demand. The value that can be mined from most discarded computers is almost always less than the cost of collection, handling, and separation. This is not surprising. Although computers are manufactured using some valuable metals, computers are highly value-added products. A silicon disk may have raw materials that cost $5 but the expertise used to produce such technology makes the price of the chip hundreds of dollars. If the price of gold or lead doubles or drops in half, it will have little practical effect on the cost of the computer and only a minor impact on the economics of recycling.

The economics of recycling are not unique to e-waste. For instance, take the case of paper recycling. If the price of collection, separation and de-inking newsprint is more expensive than the cost of virgin paper, recycled paper will not be economically viable unless it is subsidized.

Therefore, the top of the waste management pyramid, reuse, is the key to economic computer recycling. If the components of a discarded computer, such as the hard disk, are still marketable, then it is more likely that the computer can be recycled profitably.

Since the value of the harvestable raw materials in a computer is limited, the other variable is the cost of separation and handling. If computers were manufactured with reuse and disposal in mind, then the cost of separation and handling could be reduced. The European Union is banning certain toxic metals from computers and requiring manufacturer take-back of obsolete computers. These laws will encourage changes in how computers are constructed so they will be easier to recycle or dispose. The economics are not likely to change. Fees, tax incentives, manufacturer subsidies are likely to be needed to create the economic incentives to recycle computers.

There are two alternatives when recycling is not economically viable. One is disposal in a municipal landfill that is allowed because of the household waste exemption. Some municipalities are enacting local laws that prohibit such disposal, however. The other alternative is disposal in a hazardous waste landfill that is built and operated so that toxic metals do not leach into the environment. The second option is the preferable environmental option if recycling of e-waste is not subsidized.

Question 3. What are the consequences for your industry if Congress fails to enact national electronic waste legislation?

Response. There will continue to be a patchwork of state requirements that will include different funding mechanisms, different administrative requirements, different standards that will be disruptive to industry. Even today, one of the problems without a national approach can be seen in California, where recyclers are required to prove that the computers have not been shipped from other states. A national program that standardizes the collection, handling, and recycling system would be much more efficient.

Historically, RCRA has encouraged a state-by-state approach by allowing states to be more protective than the federal rules. This allows states to experiment with different strategies to protect the environment, especially when EPA is gridlocked.

For instance, some communities have taken positive steps to remove e-waste from their municipal wastes stream. However, this type of balkanization is wasteful and discourages addressing problems that are national in scope.

Question 4. Mr. Slesinger, what are the advantages of regulating the management of electronic waste under the Universal Waste Rule compared to no regulation of electronic waste at all?

Response. The Universal Waste Rule for electronic wastes would enhance environmental protection, avoid the creation of new remediation sites, and encourage the development a sophisticated e-waste recycling industry that is required to comply with world-class environmental standards.

Today the e-waste recycling industry is still immature. It is critical that EPA adopt a regulatory approach that both encourages responsible recycling and safeguards the environment. ETC member companies have already moved to the forefront of this new industry by establishing the necessary collection networks, processing capacity, and recycling facilities in many states. In doing so, the ETC companies have worked with the states to ensure that necessary safeguards are met, including employee training, tracking of shipments, secure handling, and legitimate recycling.

We are concerned that EPA's proposed rule that would not regulate CRTs as universal waste will be the death knell for this new industry. Instead of standards to ensure safe and responsible recycling of lead-contaminated CRT glass, EPA has proposed a rule that essentially allows anybody with a hammer and cardboard box to be an exempt "recycler." In doing so, EPA is not only cutting off responsible companies at the knees, but it is also inevitably exposing the public to lead contamination from haphazard CRT recycling.

Lead is a potent developmental neurotoxicant, and is especially harmful to children. Thus, CRTs can be hazardous and should be carefully managed by responsible companies according to necessary regulatory standards. For this reason, many states currently regulate CRT glass that is sent to a dismantler or recycler as either a RCRA hazardous waste or a universal waste.

Under EPA's CRT proposed rule, new intact CRTs and new broken CRTs sent for recycling would not be regulated in any way. Used intact CRTs would have an unconditional exclusion unless they are disposed. Used broken CRTs would have a conditional exclusion, provided minimum requirements such as packaging and labeling are met. Household CRTs, even when collected and stored in bulk for recycling by commercial firms, would not be subject even to the conditional standards. Processed glass from used CRTs sent for recycling would be subject to speculative accumulation limits. There would be no limits on speculative accumulation applied to new intact or new broken CRTs or used intact CRTs, but used broken CRTs would have speculative accumulation requirements.

In the real world, commercial firms and state regulators will never be able to accurately keep track of whether CRTs collected for recycling are new, used, household, commercial, broken or intact (at least when initially picked up). Moreover, these various classifications are irrelevant to proper management and recycling of CRT glass. A state inspector at a collection or processing facility would never be able to determine whether CRT glass is subject to even the minimal standards of the conditional exclusion or is totally exempt from any standards depending on its pedigree. Sham recyclers will have a field day claiming that the CRTs piled high in their rented buildings and lead†leaching glass scattered around the property are all completely exempt from Federal waste management standards. Most importantly, commercial firms that are legitimately in the business of hazardous materials recycling, and that are willing to make the investment in proper management in accordance with generally-applicable standards, will simply be forced to abandon CRT glass recycling rather than compete with unregulated recyclers.

The practical and sensible approach is for EPA to apply the universal waste standards to all CRT glass destined for recycling at the point of commercial collection. The universal waste rule was promulgated for just this type of material. CRT leaded glass destined for recycling is just as much a waste material as spent lead-acid batteries, unused pesticides, mercury thermostats and lamps, all of which are subject to the universal waste standards. The CRT itself is a commodity; the leaded glass from a dismantled CRT is clearly a waste. Importantly, CRT glass is a waste material that poses a hazard because of its high leachable lead content that warrants universal waste stewardship.

The universal waste rule applied to recyclable CRT glass would include requirements for employee training and release response that are necessary to ensure that the glass is collected, stored, and managed in all respects to prevent the leaching of lead into the environment. The universal waste requirements would also provide

for proper packaging, labeling, and tracking of shipments of CRTs sent and received to prevent illegal dumping and ensure legitimate recycling. Most importantly, the universal waste rule would apply accumulation time limits to CRT glass to prevent speculative accumulation by sham recyclers with no intent to legitimately recycle. The requirements would also include notification to EPA and state regulatory officials of CRT waste management activities to allow necessary inspections and compliance. These requirements are appropriate and not unduly burdensome for companies engaged in the commercial collection, processing, and recycling of this hazardous waste.

Question 5. Mr. Slesinger, EPA has suggested that disposal of electronic waste in municipal landfills may not present an environmental risk, even though electronic waste fails the Agency's toxicity test. Do you agree?

Response. EPA's suggestion is not based on any reputable research. It is nothing more than speculation, and it is belied by the fact that many electronic wastes, such as CRTs, flunk the Agency's fundamental test for hazardous characteristics. The toxicity test was developed to predict what will happen if a waste is disposed in a municipal landfill. EPA's "suggestion" hints at solving the e-waste problem by pretending it does not exist. It also moves in the opposite direction as the rest of the developed world.

Please refer to the response to Senator Boxer Question No. 3 for a discussion of the critical differences of disposal in a municipal landfill and a hazardous landfill.

RESPONSES BY SCOTT SLESINGER TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. Your testimony referred to an EPA's proposed rule that would exempt some cathode ray tubes from hazardous waste regulations. What is the main danger if this rule is implemented as proposed?

Response. The proposed rule would exempt all cathode ray tubes that are sent for recycling from regulation under the hazardous waste rules. The danger is that some companies, without the requirement for financial assurance, training of employees, and tracking of wastes, will mismanaged these toxic wastes causing releases and contaminated sites. Because recyclers will not have financial assurance for cleanup, the taxpayers will undoubtedly be required to pay the cost of remediation.

By encouraging cheap, unregulated recycling, the commercial waste management industry, with significantly higher costs of environmental compliance, will not be able to compete.

Please refer to the detailed response to Senator Jeffords Question No. 4 that details the risks of the EPA proposal.

Question 2. And, in you're your opinion, would public health be better protected if cathode ray tubes are regulated as hazardous waste?

Response. Rather than require the full panoply of RCRA requirements, we suggest that CRTs, like mercury thermostats and fluorescent tubes, be managed as universal waste. This would make it easier for the generators to get CRTs disposed or recycled without the full RCRA requirements, but require recyclers to meet some minimal requirements such as financial assurance for closure, employee training and waste tracking.

Please refer to the more detailed answer to Senator Jeffords Question No. 4.

Question 3. EPA acknowledges that cathode ray tubes can leach four times the amount of lead as regulated hazardous waste. Electronic waste can also contain mercury, cadmium and other toxic substances. However, EPA has left open the possibility that municipal landfill standards are sufficiently protective to hold electronic waste.

In your opinion, do EPA's municipal landfill standards protect groundwater or other environmental values from toxic chemicals in electronic products?

Response. No, municipal landfills do not adequately protect groundwater from toxic chemicals in electronic products. Municipal landfills and hazardous waste landfills are operated very differently. First, under RCRA rules, the employees at hazardous waste sites are trained to safely handle toxic materials and are properly equipped to protect themselves from possible contamination. Second, in a hazardous waste landfill e-wastes are treated to prevent the toxic contaminants from leaching out by being coated with an impermeable substance that hardens and covers all exposed sides of the e-waste. This leach-resistant encapsulated waste is then placed in the landfill cell where it will not be disturbed. As with all waste in hazardous waste landfills, each specific waste load is mapped so that if there is a problem the waste can be dug up and properly handled. All leachate from hazardous waste landfills is collected and also managed as hazardous waste. All shipments to the landfill

are on trucks that are specially permitted to carry hazardous waste. Hazardous waste landfills are not allowed to take organic wastes. Organic wastes, such as paints, cleaning products, and household pesticides, are not allowed in hazardous waste landfills because they could promote leaching.

Municipal landfills are operated differently. First, the wastes are much more heterogeneous including acids and liquids from regular trash. Second, because of the household exemption, municipal solid waste landfills are allowed to take e-wastes and other hazardous waste. The toxic e-waste and other garbage are not treated, stabilized or encapsulated. Unlike hazardous waste landfills, the wastes are commingled, crushed in the truck and mixed with the other garbage. Because of daily cover, e-wastes such as CRTs are likely to be repeatedly bulldozed and broken, leading to more surface area of the leaded glass being exposed causing more leaching. There is no way to know where the particular hazardous wastes are buried as all the wastes are commingled. With the acids and different bio-degradables in the garbage, and the lack of encapsulation treatment, the likelihood of lead leaching is significantly higher than in a hazardous waste landfill. Despite this, the leachate collected from an MSW landfill is not considered a hazardous waste. Although municipal and hazardous waste landfills may be constructed with similar attributes, the operation of hazardous waste landfills makes them more protective of the environment for disposing of toxic wastes.

Question 4. The companies that you represent are among the most heavily regulated entities that handle hazardous waste in the United States. Please describe the environmental and public health benefits of going to a hazardous waste landfill versus a municipal landfill.

Response. Certain types of hazardous waste, such as toxic metal-bearing wastes, should be disposed in hazardous waste landfills. As my answer to your previous question indicates, hazardous waste landfills are built and operated so these substances do not leach into the environment. Our Nation uses many toxic chemicals that are a necessary part of the standard of living we enjoy today. With hazardous waste landfills, the toxic wastes of society are intended to remain safely within the landfill indefinitely. In many cases, states now require our companies to establish perpetual funds to monitor the landfill and provide the states with a source of funds if toxic wastes ever escape from the landfill. These specialized facilities cost more to operate and use, but the increase in environmental protection versus disposal in a municipal landfill is substantial and worth the investment.

Question 5. A company that you represent, Onyx Environmental Services, was recently approved as a "collector" and "recycler" under California's recycling law.

How many facilities does Onyx have in California and what types of recycling services does it offer? Is Onyx generally happy with California's recycling program?

Response. Onyx has a total of 10 facilities located throughout California. These include a waste-to-energy facility (Montenay Power), several 10-day transfer facilities, service centers and Industrial Service Groups. A facility in Azusa recycles the E-waste under SB50 within the State of California. In addition, this location recycles/reclaims thinners, solvents, mercury compounds, laboratory chemicals and other types of acids and caustics.

Overall, Onyx has been pleased with the California recycling law (SB50). While payments to some of the recyclers have been delayed, it is often due to deficiencies in the paperwork process. I believe it to be very important that the State continue to require detailed paperwork since the real opportunity for recyclers to import covered electronics from out of State generators will continue to tempt those recyclers not committed to ethical standards. With that said California is leading the way and influencing change in other parts of the Country which inevitably will have far reaching effects in diverting E-waste from landfills.

RESPONSE BY SCOTT SLESINGER TO AN ADDITIONAL QUESTION FROM SENATOR LAUTENBERG

Question. Mr. Slesinger, you probably heard my question to Mr. Dunne about whether EPA would issue a "universal waste rule" for the leaded glass in computers, in order to control this highly toxic heavy metal. Would you like to respond to his comments?

Response. EPA has proposed not to regulate CRTs under the universal waste rule. Mr. Dunne did not indicate whether the Agency would follow that proposal in the final rulemaking or follow the comments of many states and our Council to regulate leaded CRTs as universal wastes. As I indicated in the response to the question above (Senator Jeffords Question No. 4), we believe that the arguments made by

EPA in the proposal were seriously flawed. For instance, EPA considered leaded glass, broken or not, to be a commodity because the glass had a positive value and generators would therefore be careful and protective. However, the value of leaded glass is now about zero. This calls into question the entire theory of assuming that generators will be careful with the glass when it has no value. Second, I believe the interest of encouraging an e-waste recycling industry that would be protective of the environment would be undermined if the Agency deregulated this waste instead of requiring basic environmental standards for its proper handling.

STATEMENT OF RICHARD GOSS, DIRECTOR OF ENVIRONMENTAL AFFAIRS, ELECTRONIC INDUSTRIES ALLIANCE

INTRODUCTION

Thank you Chairman Thune, Senator Boxer and members of the Subcommittee. My name is Richard Goss, and I am the Director of Environmental Affairs for the Electronic Industries Alliance (EIA). EIA is the leading advocate for the $400 billion U.S. high-tech and electronics industries. Our 1,300 member companies provide products and services ranging from microscopic electronic components to state-of-the-art defense, space and industry high-tech systems, as well as the full range of telecommunications, information technology and consumer electronics products.

EIA appreciates the opportunity to provide the views of our membership concerning the end-of-life management of our products. We commend the Subcommittee for holding this hearing and advancing the dialogue on this important issue. We would also like to thank Senators Wyden and Talent for their efforts and leadership in this area.

INDUSTRY COMMITMENT

EIA and our member companies support the safe and appropriate recycling of used electronics products to help meet the important environmental goal of increasing resource conservation and recovery. As manufacturers, we recognize that we are a key partner in the process, and we will continue to work with Congress, federal agencies, the states and involved stakeholders to address this challenge.

The ongoing commitment of our member companies to product stewardship, environmental design and recycling can best be demonstrated by listing some of our industry's concrete achievements:

• Through a combination of direct corporate efforts and innovative partnerships—including U.S. EPA's Plug-in to eCycling campaign—EIA member companies have been involved in the proper recovery and management of well over one million tons of used electronics products. In addition, EIA member companies use significant quantities of recycled materials, including glass, metals and plastics, in new generations of their products.

• EIA member companies are on target to be in compliance with the European Union Directive on the Restriction of Hazardous Substances (the RoHS Directive), which will take effect on July 1, 2006. Since electronics products are manufactured for global sale and distribution, U.S. consumers will have broad access to products that comply with the new EU requirements.

• As a result of our members' long-standing dedication to product stewardship and technological innovation, the electronics industry continues to achieve significant and sustained environmental progress throughout the entire product lifecycle: from design, through beneficial use, to end-of-life. On the whole, every year our products become more energy efficient, use fewer materials of potential environmental concern, and become easier to upgrade, disassemble and recycle.

EIA is currently compiling a record of member-company achievements in the areas of product stewardship and design for the environment, and we will be happy to share this document with the Subcommittee once it is completed.

In summary, we support electronics recycling as a way to conserve and reclaim resources. However, this is a complex challenge that will require the coordinated efforts of all the key stakeholders to resolve.

GENERAL RECOMMENDED APPROACH

Given the complex nature of the challenge, EIA supports efforts to establish a viable recycling infrastructure in which all the major stakeholders—manufacturers, government, retailers, nongovernmental organizations (NGOs) and recyclers—participate based on their unique expertise and capabilities. The combined goal of these institutional stakeholders should be to develop a recycling infrastructure that is convenient for the residential consumer. Implementing a system based on principles of

shared responsibility will increase the efficient collection of electronics and ensure economies of scale by taking advantage of existing infrastructure. EIA supports equitable, flexible and cost-efficient solutions that encourage the proper management of used electronics while limiting additional costs to the public for these popular products.

ENVIRONMENTAL DISCUSSION

EIA believes it is essential to consider the science related to electronics products as part of any public policy discussion regarding recycling. Certain compounds are present in electronics products, such as lead and mercury, that provide clear safety, performance and energy efficiency benefits. These compounds should be appropriately managed at the end of life. U.S. EPA shares this view, and has consistently stated that used electronics products, when properly managed, do not represent a human health or environmental concern. The agency considers electronics recycling as fundamentally a solid waste management and resource conservation issue. Likewise, our member companies recognize that reusing and recycling electronics at the end of life is the most environmentally preferable option, and we support reasonable efforts to develop the recycling infrastructure.

SUGGESTED FEDERAL ROLE

As you know, three states have already enacted three very disparate statutes which address electronics recycling. Numerous other states, and even some localities, have either developed special regulations for the handling of used electronics, or are actively considering their own electronics recycling legislation. These approaches often include significant variations in terms of financing mechanisms, the scope of covered products, the roles and responsibilities of key participants, and the overall regulatory structure.

Industry and other stakeholders are rightfully concerned that a potential confusion of state recycling laws and regulations will prove costly, inefficient and perplexing. There is clearly a role for the federal government to play in bringing national consistency to this emerging field.

Federal action can help promote safe and environmentally sound recycling by creating a streamlined and uniform regulatory framework that removes artificial barriers and instead encourages the free flow of used products for proper management. Specific steps include:

- Establishing consistent regulatory definitions of key terms, and strictly defining the scope of covered products through the application of fixed criteria;
- Considering the establishment of a flexible third party organization that can help with roles such as data reporting, compliance, and financing;
- Ensuring broad consistency in labeling, product information, and regulatory reporting requirements; and,
- Assessing whether additional recycling regulations or standards are necessary to ensure the safe and environmentally sound management of used electronics.

EIA and our member companies stand ready to work with the Subcommittee on these and other initiatives. Thank you again for the opportunity to share industry's position on this important issue. I would be pleased to respond to any questions.

RESPONSE BY RICHARD GOSS TO AN ADDITIONAL QUESTION FROM SENATOR INHOFE

Question Mr. Goss, I understand that the electronics industry would prefer the federal government to offer a national waste and recycling program because it is fearful of a patchwork of state requirements. Could you explain some of the market competitiveness issues that have prevented the EIA from advancing a consensus position?

Response. First, it is important to note that our industry has successfully reached agreement on most of the primary elements of an electronics recycling approach. These elements include the following:

- National consistency in electronics recycling—particularly a streamlined and uniform regulatory framework—will encourage the appropriate and efficient management of used products.
- A viable recycling infrastructure will require that all the major stakeholders—manufacturers, government, retailers, non-governmental organizations and recyclers—coordinate efforts and share responsibility.

While used products can and should be appropriately managed at the end of life, electronics recycling is fundamentally a solid waste management and resource conservation issue.

Any recycling approach should begin with a limited and defined scope of products, rather than attempting to cover all electronics products at once.

Since the EIA member companies manufacture products for global sale and distribution, an approach should seek to harmonize any labeling, product information, and regulatory reporting requirements.

Regulations or standards for recyclers are important in order to ensure the safe and environmentally sound management of used electronics.

The one area where our members have yet to reach consensus is on a preferred approach for financing an electronics recycling infrastructure. Over the past months and years, EIA and our member companies have worked diligently to try and achieve a common position on funding. The difficulty that our industry faces in reaching consensus is directly related to the quantity and diversity of manufacturers, and to the intense competition in the marketplace. The primary products contemplated under most electronics recycling approaches—computers and televisions—are increasingly treated by the market as commodities. Since margins are thin and producers depend on volume sales, any shift in the competitive playing field can have a direct and immediate impact on market share and the bottom line.

The EIA member companies, which include all the global brand-name manufacturers of these products, hold divergent views on financing based in large part on their particular business models and corporate strategies. Specific factors include but are not limited to:

- Company size
- Number and types of product lines, and the comparative life-spans of their products
- Sales and distribution methods (i.e., traditional distribution and retail channels versus direct-to-consumer sales)
- Experiences and capabilities related to recycling
- Relative market share (i.e., current market share as compared to historical market share; business sales as compared to household sales)

Given this diversity of business models and capabilities, any particular funding approach may result in a competitive imbalance in this extremely competitive industry. Consequently, several of our member companies support an advanced recycling fee, Hewlett-Packard in particular supports producer responsibility, and other companies promote market-driven initiatives as a way to resolve the challenge.

The competitive issues are keen enough just between the EIA member companies. However, concerns over fair competition are significantly heightened due to the presence in the market of numerous small producers and/or no-name manufacturers that cannot necessarily be compelled to participate in a recycling program. These manufacturers fall predominantly into one of two groups: (1) small foreign producers that sell mostly low-end units into U.S. markets; and (2) the so-called "white box" manufacturers that produce and sell generic computers at retail or remotely via catalogs or the internet. While individual manufacturers in these categories are usually small, they nonetheless collectively represent a noteworthy segment of the market.

EIA member companies comply with existing state requirements, and will certainly step up and participate in any broader national system. The same cannot be said of "fly-by-night" companies that often frequently change brand names, or the white-box manufacturers that sell remotely. There are already serious concerns over whether states can effectively compel these manufacturers to play by the rules. For instance, the California Board of Equalization issued an opinion that it cannot impose a fee collection obligation on out-of-state retailers that have no physical presence in the state. While the state of Maine does not implement its recycling program until 2006, EIA members already have significant doubts over whether state officials can take effective enforcement actions against small foreign producers or white-box manufacturers to pay their fair share of recycling costs.

In addition, there are also concerns over how a given financing approach will apportion responsibility for orphan products—those products coming back into the recycling system that were manufactured by companies that have since gone out of business and have no successor in interest.

In summary, different business models, recycling capabilities and concerns over newer and non-traditional market entrants have resulted in differing opinions over financing. EIA and our members are continuing to ongoing commitment and concerted efforts.

RESPONSES BY RICHARD GOSS TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Mr. Goss, I understand that a European Union directive requires manufacturers to design electronics with less toxic materials. Are there similar incentives to encourage electronics manufacturers to design their products to promote easy reuse and recycling?

Response. The competitive marketplace continues to be the primary driver behind improvements in product design, efficiency and performance. The electronics industry continues to achieve significant and sustained environmental progress throughout the entire product lifecycle: from design, through beneficial use, to end-of-life. In fact, many of our companies have long-standing design-for-environment or product stewardship programs that pre-date the adoption of the European Union Directive on the Restriction of Hazardous Substances (the RoHS Directive) by several years. On the whole, every year our products become more energy efficient, use fewer materials of potential environmental concern, and become easier to upgrade, disassemble and recycle. This process of continuous evolution—driven by market demand and competition—can be readily observed by comparing today's products to similar products that were manufactured just a few years ago.

Given the intense competition in the consumer electronics marketplace, any manufacturing efficiencies that a company achieves can result in increased output while simultaneously decreasing per-unit production costs. These market-driven innovations on the production side directly translate into benefits for reuse and recycling. Please consider the following examples:

1. Manufacturers have a clear incentive to streamline and simplify product assembly by, for instance, using fewer screws and connectors. Not only does this improve production efficiency, but it makes these products easier to service during their useful lives. It also makes these products easier to upgrade, disassemble and recycle at the end of life.

2. To achieve valuable economies of scale, manufacturers are increasingly purchasing larger volumes of a single plastic, instead of smaller amounts of different plastics. The use of a uniform type of plastic makes these products easier and less expensive to recycle at the end of life.

3. Larger and heavier products cost more to transport. Accordingly, our companies strive to use lighter-weight materials as they become available in order to control transportation costs for distribution and sale. To achieve production efficiencies and meet market demand, our members are also constantly innovating to create smaller products without sacrificing functionality or performance. Since transportation costs represent one of the single largest expenses associated with recycling, these ongoing innovations directly result in products that are less expensive to recycle.

4. Metals and certain other compounds are present in electronics products because of their important safety, performance or energy efficiency characteristics. However using these materials can add costs to the manufacturing process, as companies may need to implement additional measures to ensure proper management. As technically and economically viable substitutes become available, EIA member companies have worked to reduce or eliminate the uses of these compounds. These efforts also facilitate the recycling of electronics products.

In addition, EIA member companies have gained invaluable knowledge by recovering products themselves and by working with independent recyclers. Understanding the requirements for recycling also helps manufacturers factor in end of life management considerations into the design of new products.

Many government and other institutional purchasers already include environmental requirements for electronics products in their procurement contracts. These approaches offer market incentives to those companies that can satisfy the contract specifications. EIA and our member companies are also cooperating with U.S. EPA, state governments, private entities and non-governmental organizations to standardize a list of environmental criteria that governments and other large institutional purchasers can specify when buying information technology equipment. This initiative, known as the Electronic Product Environmental Assessment Tool (EPEAT), will provide a market reward to those companies that reduce the environmental footprint of their products throughout the entire life cycle.

Finally, there are international standards for electronics products already in place or currently under consideration that focus on environmental design and recycling. Due to the global nature of the electronics manufacturing and distribution chain, international standards will be reflected in our companies' products sold in the United States. These standards will also help drive improvements in reuse and recycling.

Question 2. If the recycling of electronic waste were profitable, more businesses would be doing it and waste disposal would not be as big a problem. In your opinion,

what are the economic barriers to making recycling of electronic waste economically viable?

Response. The key economic barrier to establishing a viable and self-sufficient recycling infrastructure is that the overall costs of recycling exceed the value of the resulting commodities (primarily glass, plastic and metals). Recycling thus represents a significant and absolute cost, leading inevitably to differing stakeholder perspectives over how it should be funded and by whom.

The three major elements of an electronics recycling system are collection, transportation and the actual disassembly and recycling. The physical collection of used electronics represents arguably the biggest single economic barrier to recycling. Televisions are ubiquitous in American households, and personal computers are now nearly as prevalent. With hundreds of millions of these products spread out across urban, suburban and rural areas, collection becomes an enormous and costly logistical challenge.

The vast majority of electronics products are sold through traditional distribution and retail channels. In general, manufacturers sell products in bulk to distributors, who sell them to retailers who in turn sell them to consumers. These products then have years of useful life, and are often re-sold, given to friends or family members, or donated to charities. In most cases, manufacturers do not have a direct relationship with the end user at the time of initial sale, let alone years later when the product is ready to be placed into the recycling stream.

As a consequence, EIA and our member companies believe that an electronics recycling system should take advantage of the existing infrastructure rather than attempting to create a separate and costly system to collect used electronics products. This existing infrastructure includes municipal waste collection systems and reverse distribution systems that rely on established product distribution and retail channels.

Transportation costs are another major economic barrier to establishing a self-sufficient recycling infrastructure. As noted above, previous generations of products—particularly cathode ray tubes (CRTs)—are larger and heavier than contemporary devices. Loading and transporting large volumes of electronics long distances to centralized recycling facilities is costly in terms of time, labor and overhead, especially given the marked rise in fuel prices. Mailing back larger and heavier devices can be cost prohibitive. While these costs are not fixed—they would likely decrease if there were more recycling facilities—they can only be controlled so much and will remain a significant expense.

The labor and overhead costs to conduct the actual recycling are also significant, and the commodities generated often suffer from low prices and a lack of consistent market demand. For example, as manufacturers continue to move away from CRTs to alternate display technologies—i.e., LCD screens, plasma screens, digital light processing technology—the supply of processed CRT glass has outstripped demand. Also, since most electronics products destined for U.S. markets are manufactured overseas, the recycled commodities must often be transported thousands of miles to be used in the next generation of products.

In addition to the economic barriers, there are also regulatory obstacles that serve to artificially increase the costs of recycling. For example, the patchwork of state regulations on transport of certain electronic products aggravates the economic situation. As discussed in our testimony to the Subcommittee, one step to consider is the creation of a streamlined and nationally uniform regulatory framework for electronic products destined for recycling. This includes adoption of the proposed rule that allows for the movement of CRTs sent for proper recycling.

Question 3. What are the consequences for your industry if Congress fails to enact national electronic waste legislation?

Response. Absent a consistent national approach to electronics recycling, manufacturers, retailers and recyclers will be confronted by an expensive, inefficient and unworkable confusion of state laws and regulations. Such a patchwork of approaches will impact interstate commerce and may be a barrier to certain companies participating in the markets of some smaller states. If this state-by-state pattern is allowed to continue, it will impose an enormous administrative and logistical burden on the system that will ultimately result in increased prices to consumers for new products. As detailed above, EIA member companies are already facing competition that is unprecedented in this industry. Federal action should strive to keep costs to consumers as low as possible, create a level playing field for market participants, and ensure that the products are being recycled in an environmentally sound manner.

RESPONSE BY RICHARD GOSS TO AN ADDITIONAL QUESTION FROM SENATOR BOXER

Question. Ensuring a large amount of electronic waste for recycling can reduce the costs of recycling as more waste is fed into the system. What steps are your member companies taking to promote this type of economy of scale in recyclable material?

Response. EIA member companies have been involved in the proper recovery and management of well over one million tons—greater than two billion pounds—of used electronics products. Our companies are involved in a variety of efforts to increase the collection and recycling of used products. These efforts include: implementing individual recovery, refurbishment and recycling programs; participating in recycling partnerships with U.S. EPA, state and local governments, retailers, recyclers and charities; and sponsoring collection events and grants. We are also leading efforts to raise public awareness of the importance and benefits of recycling. In addition, our member companies use significant quantities of recycled materials, including glass, metals and plastics, in new generations of their products, thus creating demand that helps sustain markets for these materials.

It is also important to note that, regardless of the volume of used products placed in the system, recycling will likely remain an overall cost. As detailed above, collection and transportation costs each represent a significant part of the overall expense. Even with greater volumes of products and the establishment of more recycling facilities, these costs will still remain fixed within a range. The value of the resulting commodities still won't pay for the overall costs of collecting and recycling products, at least not at the present time.

STATEMENT OF DAVID ISAAC, DIRECTOR, GOVERNMENT AND PUBLIC POLICY ON BEHALF OF HEWLETT-PACKARD COMPANY (HP)

On behalf of Hewlett-Packard Company (HP), I am pleased to provide this testimony on the recycling of used electronics. My name is David Isaacs, and I am Director, Government and Public Policy, based in our Washington, DC office. HP is a technology solutions provider to consumers, businesses and institutions globally. The company's offerings span IT infrastructure, global services, business and home computing, and imaging and printing. More information about HP is available at www.hp.com.

HP applauds Chairman Thune and Ranking Member Boxer for convening this important hearing to discuss electronic waste. Today's hearing is a valuable first step in advising Members of the Senate and the public on the emerging challenge of managing and recycling used electronics in the United States. HP supports increased recycling to conserve natural resources and protect our environment through a harmonized national approach. HP calls on Congress to support a national solution to the challenge of recycling used electronics, the adoption of recycling incentives and the removal of regulatory barriers to cost-effective recycling, and market-based solutions to finance government recycling programs. HP believes that the Congress should reject attempts to impose a new tax on American consumers and to create bureaucratic recycling programs. Imposing more taxes on consumers will needlessly increase costs to the public and fail to achieve our nation's recycling goals in an efficient manner. Several decades of experience in implementing environmental laws and regulations in this country have proven that environmental goals can best be achieved by providing the private sector with flexibility and incentives to innovate.

As a major manufacturer of a broad range of technology products, as well as a leading recycler of these products, HP has a strong interest in the development of policies relating to electronics recycling. HP has nearly 20 years of first-hand experience in product take-back and recycling. Since 1987, HP has successfully collected and recycled more than 600 million pounds of used or unwanted computer-related equipment globally. With our vast knowledge and experience, HP's goal is to recycle 1 billion pounds of equipment by the end of 2007. HP encourages Congress to allow companies such as HP to maintain this flexibility in implementing recycling—which provides American companies opportunities and incentives to continue to focus on innovation—and efficiently achieve superior recycling results that best protect our nation's natural resources for future generations.

We wish to emphasize the following points in our testimony today:

- A harmonized national approach to the recycling of used electronic products is necessary to avoid a patchwork of varying state and local requirements.
- As first steps in the development of a national approach, Congress should adopt incentives for recycling, such as those set forth in the "Electronic Waste Recycling Promotion and Consumer Protection Act" (S.510); expand federal support for recycling projects; and remove regulatory impediments to recycling.

• A comprehensive national approach should promote innovation and allow for flexible implementation to achieve recycling goals in the most efficient manner.
• Congress should reject calls for new taxes on technology products and new government recycling programs.

I. A NATIONAL APPROACH IS NECESSARY AND APPROPRIATE

A national solution for the recycling of used electronic products can help promote efficiency and avoid a patchwork of inconsistent state approaches. Electronics recycling is an emerging national challenge resulting from the growing use and enjoyment of technology products and consumer electronics throughout our society. As an emerging environmental challenge, the country as a whole would benefit from a national approach that enables the United States to address this issue at a relatively early stage in its development. Environmental challenges are too often addressed by the Congress after a problem already exists. This issue presents an opportunity for the Congress to act proactively in developing a solution to an emerging challenge.

A patchwork has already begun to develop. Three states—California, Maine, and Maryland—have adopted comprehensive recycling laws for certain electronic products, but each of these laws is significantly different from the other. The most important differences are the varying methods of financing the recycling system. California has imposed a new tax on consumers to fund a bureaucratic government recycling program. In contrast, Maine has developed an innovative shared responsibility model in which the burdens of recycling are shared by various stakeholders. Manufacturers are required to pay for consolidation and recycling or to conduct recycling of their products on their own. Maryland has imposed a fee on manufacturers to finance computer recycling programs around the state, with the fee varying depending on whether a manufacturer offers a computer take-back program. Moreover, numerous states, and even some localities, have been and are considering proposals to address the management of used electronics, and we anticipate that this trend will continue.

This emerging patchwork of differing state laws is adding significant new costs and impeding the development of an efficient nationwide infrastructure, while creating the potential for consumer confusion. A consistent national approach is necessary and appropriate.

We recognize, however, that solid waste issues are traditionally managed by the states and localities. Nonetheless, a federal solution is needed in this instance not only to address disparate state program developments, but also because of the connection between the recycling of used electronics and the adoption of state-specific design standards. Several states have adopted, or are considering, mandated design requirements on new technology products as part of their recycling laws or other environmental initiatives, driven largely by concerns with environmental issues associated with disposal of used electronic products. Differing state design requirements are problematic for HP and other technology companies because our products are designed and manufactured for global distribution. Conflicting state design requirements can impair our ability to sell products globally, may needlessly raise costs, and ultimately restrict innovation in the development of new products. An effective national solution can address the concerns of the states with the disposal of used electronics, thereby avoiding the need for design standards at the state level that may balkanize the global technology marketplace.

II. RECYCLING INCENTIVES, FEDERAL SUPPORT, AND REMOVAL OF REGULATORY IMPEDIMENTS ARE APPROPRIATE FIRST STEPS IN THE DEVELOPMENT OF AN EFFICIENT RECYCLING INFRASTRUCTURE

To further the development of an effective recycling infrastructure for used electronics, HP believes that incentives to promote recycling are a useful first step. One such incentive is a tax credit for consumers to return their products for recycling and for manufacturers to offer recycling services to their consumers. In this regard, HP supports the "Electronic Waste Recycling Promotion and Consumer Protection Act" (S.510), a bipartisan bill introduced by Senator Talent and Senator Wyden. This bill would provide tax credits to help manufacturers, retailers, the recycling industry, and others to establish an efficient national infrastructure for the environmentally sound recycling of computers and other products and to encourage consumers to return their products for responsible recycling. These incentives can serve as a catalyst for voluntary, market-based solutions that avoid the need for potentially burdensome, costly mandates at the federal or state level.

Similarly, expanded government support for pilot projects and other initiatives can help promote the development of an efficient recycling infrastructure for electronics. Programs such as the "Plug-In to eCycling" initiative of the U.S. Environ-

mental Protection Agency have played a useful role in successfully recycling large volumes of products and collecting data on the nature of the issue and the range of approaches that can be successful. For example, during the summer of 2004 HP partnered with Office Depot stores nationwide on an in-store takeback program that collected and recycled approximately 10 million pounds of products in a manner that was convenient for consumers and efficient for the two companies. Another retail return program, in which HP participated, involving Staples stores in New England also proved to be successful. Continued and expanded funding for these "Plug-In to eCycling" programs can facilitate more recycling of used electronics and the development of new approaches.

Finally, the federal government can play an important role in promoting recycling by removing regulatory impediments to cost-effective recycling. Under current federal and state regulations, used electronics are sometimes classified as "hazardous waste," even though they are routinely used in our homes and offices and, when recycled, pose no risk to human health or the environment. When these used products are classified as hazardous waste, they become subject to burdensome and costly regulatory requirements associated with their collection, storage, transportation, and processing. Congress and the EPA should reform these regulatory requirements to facilitate recycling of used electronics, while continuing to protect human health and the environment.

III. A NATIONAL APPROACH SHOULD PROMOTE INNOVATION AND ALLOW FOR FLEXIBLE AND EFFICIENT IMPLEMENTATION

HP supports a comprehensive, national approach to the recycling of used electronics that allows for flexible implementation and innovative approaches that can achieve our recycling goals in the most efficient manner. In discussions with several states, we have advocated a Product Stewardship Solution that is based on implementing a market driven system for recycling CRT-containing computer monitors and TVs ("CRT devices"). The approach requires manufacturers to take responsibility for the recycling of a specified amount of CRT devices, either by implementing a recycling program to cover this specified amount or by assuming financial responsibility for this amount. It places limited responsibilities on retailers and state government and avoids creation of new taxes and government bureaucracies. It provides funds to local governments for CRT device collection, consolidation, and recycling. As a result, the approach promotes flexible and efficient implementation of CRT recycling.

Under the Product Stewardship Solution, manufacturers must take responsibility for their "equivalent share" of CRT devices—including orphan CRT devices—returned by households (individual consumers and home businesses) for recycling. They can do this either (1) by establishing a recycling program or (2) by paying the state reasonable collection, consolidation, and recycling costs for their equivalent share.[1] Manufacturers implementing a recycling program have the flexibility to design their program as they see fit, so long as they recycle their equivalent share in compliance with applicable laws and regulations.

Manufacturer equivalent shares are determined annually by the state. A manufacturer's equivalent share is that manufacturer's portion of the annual CRT device waste stream. The equivalent share concept allows manufacturers that choose to run a recycling program to satisfy their obligations with CRT devices of any brand or their own brand. This approach avoids the need for brand sorting, but preserves the ability of manufacturers to implement recycling programs that collect only their own brand products. It provides an efficient recycling system with multiple options for consumers.

Manufacturers will be held accountable to the state to meet their equivalent share obligations. This is a self-implementing performance standard keyed to a specific amount of CRT devices to be recycled. Thus, a manufacturer that chooses to provide a recycling program but fails to recycle its equivalent share has a predetermined payment obligation for the shortfall to the state. This system is designed to achieve recycling results by manufacturers, not merely to generate revenue or establish government recycling programs.

The Product Stewardship Solution has numerous benefits and advantages compared to alternative approaches such as advance recycling taxes or fees ("ARFs"):

[1] This is a hybrid approach that combines elements of a producer responsibility system and the widely supported Maryland Statewide Computer Recycling Pilot Program (HB 575). A producer responsibility system enables manufacturers to assume responsibility for their products by establishing a recycling program. The Maryland law requires manufacturers to pay to the state an annual registration fee—the amount of which varies depending on whether the manufacturer offers a computer takeback program.

A. Provides efficiencies through market-based solutions and the opportunity for improvements over time, thereby offering a lower cost solution to consumers

Relies on and leverages the expertise of manufacturers to produce competitive, market-based solutions. Key recycling responsibilities are placed on manufacturers competing among themselves in the private sector, rather than on the government, which faces no competitive pressure.

Provides flexibility to allow manufacturers to develop over time least-cost recycling arrangements. Manufacturers have broad flexibility to act individually or in partnership with others to develop recycling programs or to pay for their recycling responsibility. This provides manufacturers with maximum flexibility to be innovative and to work with recyclers to develop least-cost alternatives.

Allows collection costs and responsibilities to be determined by the market. Manufacturers that choose to run recycling programs are required to recycle their equivalent share of discarded CRT devices. But no particular entity has a mandated responsibility to collect discarded CRT devices. This fosters development of cost-effective, market-driven collection methods by manufacturers, non-profits, independent collectors, municipal governments, and others.

Provides consumers a broad range of collection/recycling options. Consumers may return their unwanted CRT devices to recycling programs offered by manufacturers or to any other recycling program—whichever collection/recycling option best suits their needs.

B. Avoids new taxes on consumers

The Product Stewardship Solution imposes no point-of-sale taxes on consumers. ARF proposals are simply a new tax on consumers to finance new government recycling programs.

C. Places key responsibilities on manufacturers, not government, to achieve recycling goals, including recycling of orphan CRT devices

Manufacturers are responsible for their contribution to the household-CRT device waste stream—the fundamental performance goal of a recycling program. Manufacturers are responsible for their equivalent share of CRT devices that are discarded each year by households, i.e., the contribution that their products make to the annual CRT device waste stream.

Manufacturers are responsible for the orphan waste stream. This includes both unlabeled CRT devices and CRT devices for which the manufacturer is no longer in business and has no successor in interest.

D. Places minimal responsibilities on retailers

Retailers are not required to impose and collect new taxes and are not obligated to collect products. The only obligations of retailers are not to sell unlabeled and unregistered CRT devices and to certify annually that they checked the state CRT device registration website to determine if the branded CRT devices they sell are registered.

E. Limits government involvement to enforcement and other necessary functions, avoiding the creation of new taxes and new agencies

Requires government to perform limited administrative and enforcement functions. These limited functions will be sufficient to establish the level playing field that makes it possible for manufacturers to provide market based recycling solutions. Among the functions performed by government are determining annual manufacturer equivalent share obligations, enforcing the requirements of the law, and collecting and compiling recycling data.

Avoids establishing new taxes and new agencies. By placing fundamental recycling responsibilities on manufacturers, there is no need for consumers to pay new taxes on their purchases of CRT devices or for new agencies to be created to collect or administer a tax. The limited government responsibilities required by the approach are designed, like the other parts of the approach, to achieve overall recycling goals efficiently.

F. Reduces burdens on local governments by providing manufacturers with incentives to keep CRT devices out of the municipal waste stream and by providing a funding source for CRT device collection, consolidation, and recycling

Provides manufacturers with incentives to keep their CRT devices out of the municipal waste stream. Manufacturers' equivalent share obligations are based on the percentage of CRT devices for each manufacturer that are collected in local government recycling programs. Thus, manufacturers have incentive to keep their CRT devices out of the municipal waste stream.

Provides local governments with a funding source for CRT device collection, consolidation, and recycling. Manufacturers that elect to pay the government for their recycling obligation, or that are required to pay for failing to meet their equivalent share obligation, provide local governments with a funding source for collecting, consolidating, and recycling CRT devices.

G. Provides the opportunity for design improvements

Allows manufacturers to benefit from improved environmental design and innovation. Those manufacturers that collect their own brand products can benefit from design improvements they have made. Moreover, the system provides an incentive to improve product design by removing materials of concern, enhancing recyclability, and incorporating recycled content into their new products.

IV. CONGRESS SHOULD REJECT NEW TAXES AS A MEANS OF FINANCING RECYCLING PROGRAMS

California has adopted a new tax, or "advance recycling fee" ("ARF"), to finance a government recycling program, and other states are considering this approach.[2] Congress should reject this approach. HP believes that a new tax on technology products to raise revenue for government to use for recycling is a poor way of achieving recycling goals.

This new tax on consumers will raise the price of technology products and, assuming it is used for its intended purpose, establish a new government program that will likely result in efficient recycling solutions. There is no incentive for improvements over time—all products are subject to the same fee regardless of the cost of recycling that product. Manufacturers and others have little incentive to reduce these costs. This new tax is a one-size-fits-all approach that removes incentives for innovation and market-based solutions, thereby likely resulting in higher overall costs. Moreover, there is the risk that the funds collected by the government would be used for purposes other than recycling, thereby failing to address the issue.

A tax-based approach suffers from other deficiencies, including the following:

A Tax on Products Is Burdensome To Retailers.—The Consumer Electronics Retailers Association ("CERC"), supported by retailers such as Best Buy Co., Circuit City Stores, Inc., Radio Shack Corp., Sears Holdings, Target, and Wal-Mart, opposes an ARF because an ARF is "administratively burdensome for all parties;" and "too complicated for all parties."[3]

A Tax Finances A Large New Government Program.—A tax-based system requires receipt and administration of new sales taxes on consumers transmitted by likely thousands of retailers and distribution of the tax proceeds to hundreds of collectors and recyclers. The result is a large new government program with substantial administrative expenses.

The Tax Revenues Can Be Diverted For Other Governmental Purposes.—The tax revenues may be diverted to finance other governmental programs. Given tight government budgets and numerous competing priorities, governments often shift spending from one area to another. Indeed, there is no way to prevent a future legislature from taking such action. Numerous recycling and other environmental programs based on special taxes or fees that are presumably dedicated to a specific purpose have witnessed the funds being shifted to other uses.

A Tax System Does Not Guarantee That Any Amount of Electronic Devices Will Be Recycled. Although proponents of tax-based recycling systems typically call for achieving numeric collection goals, the proposed systems provide no mechanism for enforcing these goals or ensuring that any amount of electronic devices are actually recycled. The California ARF statute does not require that any amount of discarded electronic devices must be recycled. The only guaranteed outcome of these tax-based systems is the generation of new tax revenue for government, not the recycling of products.

Collection And Administration Of Taxes By A TPO Raises Concerns of Efficiency, Expertise, Legality, and Accountability. Some proponents of new taxes advocate the formation of a "Third Party Organization" (TPO) to receive and administer the government-imposed taxes collected by retailers. This proposal raises concerns of efficiency, expertise, legality, and accountability:

- The TPO duplicates functions currently performed by government agencies.

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[2] Supporters of this approach refer to it as a "fee" and not a tax. The law generally distinguishes between "taxes" and "fees" based on whether the payment provides a public benefit (a tax) or a specific service (a fee). *National Cable Television Assn.* v. *United States*, 415 U.S. 336 (1973). Because the revenue raised provides a general public benefit and not a specific service for the consumer paying the tax, an ARF is properly characterized as a tax.

[3] See http://www.ceretailers.org/cerc/CERC—Position—on—eWaste.pdf.

• The TPO lacks the expertise of existing tax collecting agencies and is unlikely ever to acquire equivalent expertise.
• The lack of accountability of the TPO to the government for TPO expenditures of public revenues raises significant legal issues. A TPO would control public tax revenues without congressional oversight over appropriations.
• TPO proposals provide no accountability if the TPO fails to achieve recycling goals or fails to meet other obligations. There is no ability by the government to enforce against a TPO.

An ARF Constrains Competition And Limits The Efficiencies To Be Gained From Competition. A new tax to fund a monopolistic recycling program fails to establish a competitive environment that will provide incentives for improved performance. Under the California ARF system, all collectors and recyclers receive a uniform rate of compensation set by the state. In ARF systems that depend on a TPO, the only possibility of competitive bidding is with a monopoly organization that sets the bid requirements. This is not the same as a fully functioning private market with multiple manufacturers seeking recycling services.

V. CONCLUSION

HP supports a Product Stewardship Solution that requires manufacturers to take responsibility for their equivalent share of CRT devices returned for recycling by households, that places minimal responsibilities on retailers and state government, and that provides local governments with funds for CRT collection, consolidation, and recycling. Overall, this approach offers a more efficient and flexible way to achieve our recycling goals.

HP looks forward to working with the Subcommittee and other Members of Congress on the development of a national recycling system that leverages the capabilities and expertise of manufacturers, retailers, recyclers, and others to achieve efficient and low cost opportunities for all consumers.

STATEMENT OF THE RETAIL INDUSTRY LEADERS ASSOCIATION

The Retail Industry Leaders Association (RILA) appreciates the opportunity to provide the committee with comments on the need for a national electronics management system and applauds the leadership of Chairman Thune and Ranking Member Boxer for holding a hearing on this important environmental issue.

By way of background, The Retail Industry Leaders Association (RILA) is an alliance of the world's most successful and innovative retailer and supplier companies—the leaders of the retail industry. RILA members represent more than $1.4 trillion in sales annually and operate more than 100,000 stores, manufacturing facilities and distribution centers nationwide. Its member retailers and suppliers have facilities in all 50 states, as well as internationally, and employ millions of workers domestically and worldwide. Through RILA, leaders in the critical disciplines of the retail industry work together to improve their businesses and the industry as a whole. The mission of RILA is to lead and serve the most successful and innovative retailers and suppliers through the delivery of world class education, innovation and advocacy.

RILA strongly believes that a federal solution that encourages the proper collection and recycling of electronic waste is far more practical than dealing with a patchwork of 50 or more different "eWaste" laws instituted by individual states and localities. This year alone, 30 State and local legislatures have introduced over 50 separate bills on this issue. It would be impractical and ineffective to expect retailers and manufacturers to comply with over 50 eWaste programs, and, if Congress legislates in this area, we urge it to create a strong federal preemption of state and local law.

RILA also supports a "producer responsibility" eWaste recycling model, and is working with the Consumer Electronics Retailers Coalition (CERC), state retail associations and other interested stakeholders in advocating this approach. A producer responsibility approach would make manufacturers responsible for the recycling of electronic devices in an efficient and cost-effective manner that fits into each individual company's business model. This program may also include participation from distributors, retailers and consumers, all of which benefit from the sale of electronic products. A producer responsibility model, similar to those adopted in Maine and Maryland, provides consumers with a variety of choices and manufacturers with flexibility to implement practical electronics recycling programs that make sense to customers, government, retailers and manufacturers alike.

A producer responsibility model also gives retailers the ability to develop voluntary recycling programs for their customers. For years, many retailers have

partnered with manufacturers and certified recyclers to periodically offer recycling programs that encourage customers to return obsolete electronic equipment for recycling. These programs have proven to be successful and popular for all parties involved and such private sector initiatives should not only be permitted, but also encouraged through public policy.

RILA strongly opposes eWaste policies that would mandate that retailers collect and/or dispose of used or unwanted electronic products. Retail stores are designed to make the shopping experience as enjoyable as possible for consumers. They are not designed to serve as collection centers, nor do they have room to store discarded products targeted for recycling. Retailers are highly efficient distributors of consumer products who operate on razor thin profit margins. Forcing them to play the role of recycling centers will add significantly to the cost of doing business. We urge Congress to reject mandated retailer recycling programs.

In addition, RILA also opposes "point of sale advance recovery fee" (POSARF) programs such as the one adopted in California. Experience has shown that a POSARF does not accomplish its goals, is administratively burdensome for all parties, and only guarantees a new revenue source for government without guaranteeing that an effective recycling system will be put into place. In addition, such a program provides no incentive for the design of more environmentally friendly products, and fails to take advantage of market forces to reduce the cost of recycling over time.

Finally, RILA endorses the "Electronic Waste Recycling Promotion and Consumer Protection Act" (S 510), legislation introduced earlier this year by Senators Jim Talent (R–MO) and Ron Wyden (D–OR). This bill would give consumers a one-time tax credit for turning in electronic equipment to a qualified recycler. It also provides manufacturers, retailers and qualified recyclers tax credits over a 3-year period for recycling a certain amount of e-waste each year. This bill appears to be a cost-efficient and potentially successful approach to jump-starting the development of a national eWaste recycling industry. RILA hopes Congress will view this tax credit as a viable and creative opportunity to deal with electronics at their end of life, and urges it to enact the bill quickly.

RILA is dedicated to working with the Subcommittee and other Members of Congress on developing a fair and effective program for the recycling of electronic products. The fact that states and localities continue to consider their own recycling initiatives that impose inconsistent requirements on retailers and manufacturers is clear evidence that Congress should move quickly to develop a federal solution.

STATEMENT OF BASEL ACTION NETWORK, SEATTLE, WA

THE PROBLEM

Volume of e-Waste

Gartner, Inc, a research firm, states that Americans discard 133,000 PCs daily. This doesn't include televisions, cell phones, fax machines, and other electronics. EPA estimates that American dispose of 3 million tons of outdated or broken electronic devices annually. This fastest growing segment of the waste stream is largely invisible, unless one has the opportunity to visit the massive warehouses filled with pallets and huge boxes of monitors, central processing units, TVs, printers, etc. The average length of time Americans keep their computers is 18 months. Lease agreements between electronics manufacturers and their corporate/institutional customers guarantee a complete replacement of all units within agreed upon timeframes, usually 1–3 years. Where do the "old" ones go? We have created societies that thrive on, even depend on, the latest technology, generating massive volumes of unwanted electronics. But they are laden with toxins, and we must create legislation to safely manage these mountains of unwanted electronics without impacting human health or the environment in any country.

Toxicity of e-Waste

The sheer volume of electronic or e-waste is stunning, but it is only part of the problem. Electronics are made of many materials, some of them benign, and some of them quite toxic. Lead, mercury, beryllium, cadmium, hexavalent chromium, and brominated flame retardants are only a few of the many toxins that comprise electronic devices. Many of the substances in electronics are on the U.S. EPA's 1998 "Draft RCRA Waste Minimization List of Persistent, Bioaccumulative, and Toxic Chemicals" (PBTs). The EPA set a national goal of reducing the amount of these persistent biological toxins in waste by at least half by this year, and yet the levels of many of them continue to rise in the environment and in body burden samples taken in studies. PBTs remain in the environment for a very long time without de-

grading, accumulating in fatty tissues of humans and animals. This results in increasing concentrations as the persistent toxins move up the food chain. They also readily bio-transport, moving easily through air, water and soil to places far from where they originated.

For more information on toxins in electronics, see attached Greenpeace document entitled, "Toxic Tech: Dangerous Chemicals in Electronic Products", available at: http://www.greenpeace.org/international/press/reports/toxic-tech-chemicals-in-elec

For information on the health impacts of these toxins, go to the following websites:

- Global Alliance for Incinerator Alternative (GAIA) at http://www.no-burn.org/resources/index.html#top
- International POPs Elimination Network at http://ipen.ecn.cz/index.php?z=&l=en&k=home

Export of e-Waste

Largely unregulated in the United States, this massive volume of hazardous material is being managed in a myriad of ways, including landfilling it, illegally dumping it, sending it to federal penitentiaries where prisoners disassemble it, or to private sector recyclers who manually disassemble or mechanically shred the end-of-life electronics. But currently the most lucrative 'solution' to this toxic waste problem is to export it to developing countries that are in need of materials to manufacture the world's trinkets and tools. The lack of regulation and complete absence of control of these exports result in U.S. hazardous e-waste flowing to developing countries where impoverished or displaced communities, desperate for work of any kind, suffer the profound effects of recycling hazardous e-waste, dramatically impacting human health and the environment. These communities are faced with the choice between poverty or poison, and frequently choose to accept the developed world's unknown toxins in exchange for food on the table and schools for their children. Please view our 23-minute film, "Exporting Harm: The High Tech Trashing of Asia", documenting the toxic recycling of U.S. e-waste in China (available from Grant Cope in Senator Boxer's office).

In our film and report by the same name, (http://www.ban.org/E-waste/technotrashfinalcomp.pdf) we document some of these impacts on the region called Guiyu, in the Guangdong Province in SE China. Here, families live and work in yards where they use primitive and toxic techniques to dismantle and process e-waste primarily from the US, but also from Japan and other developed Nations. For example, they remove and sell the copper yokes from the back of the cathode ray tubes (picture tubes), then throw the leaded glass into their former irrigation ditches, which brought water to rice patties until about 8 or 9 years ago, when they found they could make a little more money by scavenging materials from e-waste. Each monitor tube has 6-8 pounds of lead.

Without any protection from lead fumes, mostly women and girls heat circuit boards over open pools of molten lead-tin solder, plucking individual circuits from the heated boards.

The loosened chips are then sorted for re-sale or to be sent to acid chemical strippers to recover gold from the chips. These acid operations are located on riverbanks out of town, where they heat a mixture of 75 percent pure hydrochloric acid and 25 percent pure nitric acid to dissolve tiny amounts of gold from the chips. Then the workers dump the pure acids and dissolved heavy metals directly into the rivers. The water table in the Guiyu region is so toxic that hundreds of vendors truck in water from another town on a daily basis. Our samples of river water and sediments revealed some extraordinary test results for 18 different heavy metals and elements, available on page 47 (Annex II) and page 48 (Annex III) of the Exporting Harm report (linked above). One water sample yielded a lead level that was 2400 times higher than the World Health Organization's limit for lead in drinking water. Page 14 displays a photograph of computer asset tags found on computers in China—computers from the United States, including a State of California medical facility, the L.A. Unified School District, the City of Los Angeles.

Other neighborhoods in Guiyu sort small computer wires by day, and burn them by night in open fires. These copper wires have a PVC sheathing, which creates dioxins and furans—some of the most toxic substances known to humankind—when melted at low temperatures. Dioxins have no smell or taste; they are invisible threats.

Volume of e-Waste Exported

No one knows the amount of electronic waste being exported from the US; this fact in itself is important, as it indicates the sheer irresponsibility of the United States (unlike most other countries) in controlling and monitoring its exports of haz-

ardous e-wastes, frequently in violation of laws in recipient countries. [To see the Auststralian Government's "Criteria for the Export and Import of Used Electronic Equipment", go to http://www.deh.gov.au/settlements/publications/chemicals/hazardous-waste/electronic-paper.html]

The fact is electronic waste is leaving the United States by ocean-going container loads daily. Anecdotal reports from U.S. recyclers indicate that, of all the electronics collected in the United States by recyclers, 80 percent-90 percent of it goes offshore. Aggressive buyers from Asia, particularly China, are purchasing as much as electronic waste as they possibly can, with "toxins along for the ride", in order to obtain copper, aluminum, steel and precious metals at lower costs than if they mine and smelt primary ore in their countries. Because the United States has failed to implement its legally binding obligations to control and monitor its exports of hazardous wastes (see below), these massive volumes of toxic e-waste are exported anywhere in the world, frequently in violation of laws in recipient countries, and many times with horrific impacts.

Even if the United States had the political will to oversee it exports of toxic waste to poor countries, there are no harmonized tariff codes (used to document international trade) that distinguish between waste and new electronics. Because of this, there is currently no customs information on e-waste available.

Why is e-Waste Being Exported

The United States is the only developed country not to ratify the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal" (Basel Convention). 165 Nations, however, are a Party to this Convention, and apply Basel restrictions and definitions of hazardous wastes when it comes to exports and imports of such. Despite the United States refusal to respect the Basel laws and definitions that govern most of the rest of the world's trade in hazardous waste, the United States has ratified a multi-lateral agreement governing trade in hazardous wastes between the 30 Organization for Economic and Cooperative Development (OECD) countries, but has failed to implement its legally binding obligations. (More details below.)

Without any controls on the export of hazardous e-waste, the resulting free-for-all is based on pure profitability, regardless of toxic impacts or violation of laws in recipient countries. In this country, the sheer economics of the waste trade, without restrictions, are a powerful incentive to do the wrong thing. Waste generators and/or their recyclers are faced with a choice: either pay to have their unwanted electronics properly managed, or be paid by brokers who whisk them away to developing countries. For some, it's a simple choice between an expense or revenue, and when it involves a lucrative way to get rid of toxic materials, many make this choice. Other individuals, corporations and institutions who have concerns about data security, liability for improper hazardous waste disposal, and even impacts on citizens in developing countries, make better choices. But these choices about how to manage this hazardous waste stream should not be completely left up to individuals and corporations. The U.S. Government must join the global community and ensure that all citizens of the world are protected from U.S. toxic electronic wastes.

One might argue that importing countries should 'just say no' to toxic U.S. e-waste, but in so many developing countries, the lack of environmental laws, poor enforcement, the need for raw materials for manufacturing and the jobs that come along with it, and widespread corruption result in open ports for toxic waste shipments. It is more difficult for any Nation to control its imports than its exports, as the United States found out after September 11th. As called for in the Basel Convention, each Nation must be responsible for controlling and monitoring its exports of hazardous wastes. Decontaminate the wastes in developed nations, keeping jobs here, and then send the clean commodities any where in the world.

U.S. vs. *International Laws* Pertaining to e-Waste

The Basel Convention is a multilateral environmental agreement under the auspices of the United Nations Environment Program (UNEP) that is noted for being the first international treaty that promotes environmental justice. It was designed to protect developing countries from being disproportionately burdened by hazardous wastes via trade, simply due to their economic status. The original treaty called for a minimization of transboundary movements of hazardous wastes and national self-sufficiency in waste management by all countries.[1] In 1995, by consensus vote, the Basel Convention banned the export of hazardous wastes for any reason from European Union (EU) or Organization for Economic Cooperation and Develop-

[1] Article 4, paragraph 2(d) and 2(b) respectively; www.basel.int

ment (OECD)[2] countries to all other countries, and proposed this ban as an amendment to the Convention. This is known as the Basel Ban Amendment.[3] Although this amendment is still acquiring the necessary ratifications to enter into strict legal force globally, it has already been implemented by many of the nations that have ratified it, including the entire European Union.

The United States signed the Basel Convention in 1989 but has to date failed to ratify it. There are only three countries that signed and never ratified. These countries are Afghanistan, Haiti, and the United States.

Indeed, the United States is the only developed country in the world that has not ratified the Basel Convention. Furthermore, because the United States has created exemptions from controls in the Resource Conservation and Recovery Act (RCRA) for wastes deemed recyclable, we are now the only developed country in the world that allows electronic waste to flow uncontrolled as a toxic tide out of our borders. Every week, hundreds of container loads of hazardous electronic waste flow across U.S. borders to disproportionately burden foreign communities. This is not legal in any other developed country. The irony of this is that the United States is where the concept of "environmental justice" was born. Environmental Justice Executive Order 12898 requires that each federal agency include environmental justice as part of its mission by identifying and addressing, as appropriate, disproportionately adverse human health or environmental effects of its programs, policies, and activities on people of color and low-income populations in the United States and its territories. The U.S. Office of International Affairs' 2004 Environmental Justice Action Plan states, "OIA's senior leaders are committed to the principles of environmental justice both at home and abroad."

If the toxic impacts on these communities were not a big enough affront, it must be understood that this policy of "free trade in toxic waste" is actually illegal in the United States and promotes illegal activity in developing countries globally. The OECD has treaties binding on the United States, governing the transboundary movement of hazardous waste, and the United States turns a blind eye to these legally binding obligations. Indeed, the United States is in direct violation of one of these OECD treaties.

In 1986, the Organization for Economic Cooperation and Development (OECD) adopted Council Decision-Recommendation C(86)64(final)[4] (OECD Decision) which has to do with hazardous wastes exported from the 30 developed nations who comprise the OECD. Decisions of the OECD Council are legally binding upon Member countries at the time of the adoption of the decision.[5] Since the United States was a member country in 1986, the OECD Decision is legally binding on the United States. Some of the more pertinent OECD Decision elements that the United States agreed to implement are as follows:

i. "Monitor and control exports of hazardous wastes to a final destination which is outside the OECD area; and for this purpose shall ensure that their competent authorities are empowered to prohibit such exports in appropriate instances;"

Reality in the United States today.—U.S. competent authorities are empowered to forbid only some of their exports but remarkably do not consider lead-acid batteries, electronic wastes and other OECD-defined hazardous wastes to be hazardous waste. This is illegal when they are exported. The United States has failed to harmonize its definitions of hazardous wastes with those in the OECD regime.

ii. "Apply no less strict controls on transfrontier movements of hazardous wastes involving non-member countries than they would on movements involving only Member countries;"

Reality in the United States today. Transfrontier shipments between OECD member States of cathode ray tubes (CRTs), and/or CRT glass, for example, must in fact be controlled within the OECD as it is part of the "amber" list under Council Decision C(92)39/Final, as amended by (2001)107/Final[6] (governing recycling trade in hazardous wastes between Member States). Thus, in fact, the United States is violating this provision.

iii. "Prohibit movements of hazardous wastes to a final destination in a non-Member country without the consent of that country and the prior notification to any transit countries of the proposed movements;"

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[2] An organization representing the interests of 30 developed nations; www.oecd.org

[3] Decision III/1 of the Basel Convention

[4] Decision-Recommendation of the Council on Exports of Hazardous Wastes from the OECD Area, 5 June 1986, C(88)90(Final) see *http://www.oecd.org.* Note that Decision-Recommendations include both Decisions and Recommendations.

[5] Art. 5(a), OECD Convention, see http://www.oecd.org.

[6] See http://www.oecd.org/pdf/M00029000/M00029772.pdf

Reality in the United States today. The United States does not require the consent of the receiving country for hazardous electronic waste, lead-acid batteries and other hazardous waste exports, as defined by the OECD, and thus, is in clear violation of this obligation.

iv. "Prohibit movements of hazardous wastes to a non-Member country unless the wastes are directed to an adequate disposal facility in that country."

Reality in the United States today. The United States exercises no control, nor shows any concern as to whether exported hazardous wastes are destined for adequate facilities, or even whether they are recycled or simply dumped.

U.S. vs. *International Definitions of Hazardous Wastes*

It is also essential to understand that United States intentionally does not harmonize its definitions of hazardous wastes with international ones found in the Basel Convention and the OECD treaties. While this is acceptable for domestic only transactions, it creates a huge loophole and illegalities for export. Once U.S. companies load up containers with material that is designated as hazardous waste internationally, and that container gets outside of U.S. territory, it automatically falls under the umbrella of international laws and definitions, whether we like it or not.

The definitions applicable to the OECD C(86)64(final) that have to do with wastes exported from the OECD area have been amended to those found in Council Decision C(88)90(Final)[7], which in turn has been amended by C(94)152(Final)[8].

The definition of hazardous waste in C(94)152(Final) calls any waste listed in a core, Y list of hazardous constituents to be controlled as a hazardous waste, as long as they possess hazardous characteristics listed in Table 5. The Y list includes lead, listed as Y31—"Wastes having as constituents lead or lead compounds". Table 5 includes substances considered H11—"toxic", H12—"ecotoxic", and H13—"capable, by any means, after disposal, of yielding another material, e.g. leachate, which possesses any of the characteristics listed above."

Because of their lead content, CRTs, circuit boards, and lead-acid batteries, etc., have been demonstrated to create toxic lead leachate by virtue of their failure to pass the Toxic Characteristic Leachate Procedure (TCLP) threshold of 5mg/l. It is clear that CRTs and circuit boards, as well as equipment containing CRTs, CRT glass, or circuit boards fall under the OECD Council Decision-Recommendation C(86) 64 (final) having satisfied both the list and Table 5. Other toxic materials in electronic waste, such as mercury, beryllium, and hexavalent chromium, are also designated as hazardous waste under the OECD treaty, and therefore the exports of e-waste with these constituents ought to be controlled and monitored.

The United States' claim that certain wastes are not hazardous simply because they are recyclable and can therefore be freely traded is not consistent with U.S. obligations under OECD accords. The United States currently is in direct violation of their OECD treaty commitments. The violation also allows for the disproportionate burdening of developing country communities with U.S. toxic e-waste.

U.S. e-Waste Trade Violates the Laws of Importing Countries

The export of hazardous waste without controls also violates the laws of many developing countries globally. The Basel Convention forbids any Party to the Convention (165 nations) from trading with a non-Party, without a special bilateral or multilateral agreement. Because the United States is not a Party to the Convention and virtually every other country in the world is, most countries cannot accept hazardous waste, as defined by the Convention, from the United States. The only exception to this rule is 30 OECD countries that have signed waste trade accords, for example, for recyclable wastes. However, any Basel country that is not an OECD member State (there are about 132 of these, including virtually all Asian countries except Japan and South Korea), cannot legally accept hazardous waste, such as e-waste, from the United States. To do so is illegal traffic with criminal sanctions applicable.

Every day, container loads of hazardous electronic wastes are leaving the United States with the full knowledge of EPA, and Commerce and State Department authorities; once these container loads arrive at most importing nations' ports, they are contraband. Many countries like China have made it very clear they do not want this hazardous waste, have passed national importation bans, and have announced these import bans through the formal conduit of the Basel Convention Secretariat. Still the U.S. EPA, Commerce and State Departments ignore these violations. Imag-

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[7] OECD Council Decision C(88)90(final), see http://www.olis.oecd.org/horizontal/oecdacts.nsf/a0da5457376d5a1f412569750054d65b/eca14832de914b75c1256acb005158fb?OpenDocument

[8] OECD Council Decision C(94)152 (final), see http://www.olis.oecd.org/olis/1994doc.nsf/linkto/c(94)152-final

ine if the shoe was on the other foot, and China continued to knowingly send us thousands of tons of material each year that is in clear violation of our laws. Wouldn't this be considered at least a diplomatic affront?

The EPA has refused to list the countries for which imports of electronic waste from the United States are illegal, despite being urged at length to do so, and despite considerable recycling industry support for the notion during EPA's development of the Plug-In to e-Cycling electronic waste recycling guidelines. Nor has the EPA warned U.S. recyclers that it is illegal for those 130+ countries to receive hazardous waste, including electronic waste, from the United States. Furthermore, the Plug-In Guidelines created definitions for electronic waste that are completely incompatible with those developed (even with the United States present and active in the negotiations) at the international level in the Basel Convention[9]. This makes it even more difficult for recyclers and exporters in the United States to comply with importing countries' laws (which are based on international definitions). This appears to indicate a willful disregard on the part of EPA to respect those laws, and the principles of environmental justice upon which they are based.

Likewise, in the drafting of the rule on managing CRTs, the EPA was roundly criticized for providing no controls on the export of these toxic wastes. The final rule is yet to be promulgated, but it is not expected that Basel-like controls will be applied to the export of CRTs or CRT glass.[10]

"As boundaries between domestic and global environmental issues erode, environmental challenges facing the United States have become more complex. In an increasingly interconnected world, domestic environmental quality and public health often require global action, which in turn have economic, political, cultural, and humanitarian implications. As in the United States, the burden of a degraded environment in developing countries has been even greater to minority and low-income communities, often with little or no inclusion in the decision-making processes.

"The fair treatment of all people and their right to meaningful involvement in the environmental decision making process does not exist in many countries. OIA has the challenge of respecting the traditions, laws and protocols in the countries where we work, while encouraging environmental justice for all people."—Office of International Affairs' Environmental Justice Action Plan

Unintended Consequences of the California e-Waste Bill

Because the financing scheme in CA SB 20/SB50 only covers display devices such as monitors and TVs, consumers are bringing to recyclers these items along with non-covered devices, such central processing units (the computer box), printers, fax machines, etc., and asking recyclers to also take them for free. Many recyclers in CA quickly learn that the only way they can avoid the expense of properly recycling these non-covered devices is to export them to developing countries, which generates more revenue for them. The net result is an increase in exports of hazardous waste (as defined internationally), while at the same time collecting the leaded glass tubes for proper recycling.

THE SOLUTIONS

It is essential in any national legislation define the scope of products to include all components that are defined as hazardous waste internationally (listed above). In this way, legislation will not result in an increase in exports of non-covered hazardous wastes (as defined internationally).

Control and monitor of exports is a federal jurisdiction. National legislation requiring the collection and recycling of unwanted electronics must forbid the export of hazardous e-waste based on U.S. OECD obligations, the Basel obligations of other nations, and the Basel/OECD definitions of hazardous wastes in use by almost all other nations besides the United States. This means that any waste electronics or untested or non-working electronics that contain a cathode ray tube (CRT), circuit boards that use lead solder, mercury, beryllium, PCBs, or any e-scrap or untested/non-working equipment with them in them, must be kept in OECD/EU countries only for recycling or disposal. After decontaminating the hazardous wastes, clean commodities can be sold anywhere in the world.

Provide a funding mechanism that no longer allows the United States to externalize the end-of-life costs of these toxic electronics onto citizens in developing countries, and prisoners in this country. We believe the best financing system is to require all original equipment manufacturers (OEMs) to pay an advanced recycling fee

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[9] A full critique of these Guidelines is available at: http://www.epa.gov/epaoswer/osw/conserve/plugin/pdf/guide.pdf

[10] For a full critique on the draft CRT rule see: *http://www.ban.org/Library/BAN—comments—CRTrule.PDF*

(ARF) on every product sold in the United States into a non-profit, third party organization (TPO). This TPO would be responsible for managing the full participation of OEMs, contracting for the collection and recycling of electronics, informing the public about the free recycling options, and managing the funds. We do not believe an ARF collected at the point of retail is an acceptable solution, because this toxic waste problem belongs to the manufacturers, who must oversee the end-of-life management and costs. This 'extended producer responsibility' provides a direct financial incentive to redesign the products with fewer toxins, make them more upgradeable, more easily recycled. In order to provide widespread collection options to urban and rural citizens, collection payments can be offered to existing and new infrastructure (if they choose to opt into the system), including recyclers, charities, municipal waste collection facilities, retailers, and mail back programs with the manufacturers.

Legislation must also require that adequate recycling and reuse standards are set to ensure that occupational and public health are protected from the many toxins in e-waste, and that adequate financial assurances exist to cover environmental, liability, closure, and other costs are in place.

Hazardous e-waste must be prohibited from landfills, incinerators (including waste to energy incinerators), and prison recycling operations, based on definitions that recognize toxicity of any waste or unwanted electronic.

Create new harmonized tariff codes for the various components of used electronics, based on international definitions of hazardous waste, and requiring a distinction between tested working used equipment vs. untested/waste equipment or components.

An official enquiry must be made into the U.S. violation (documented above) of the 1986 OECD accord on hazardous waste exports. The United States must finally implement its legally-binding obligations under the OECD treaty, requiring that we:

- "Monitor and control exports of hazardous wastes to a final destination which is outside the OECD area; and for this purpose shall ensure that their competent authorities are empowered to prohibit such exports in appropriate instances;"
- "Apply no less strict controls on transfrontier movements of hazardous wastes involving non-member countries than they would on movements involving only Member countries;"
- "Prohibit movements of hazardous wastes to a final destination in a non-Member country without the consent of that country and the prior notification to any transit countries of the proposed movements;"
- "Prohibit movements of hazardous wastes to a non-Member country unless the wastes are directed to an adequate disposal facility in that country."

STATEMENT OF THE CONSUMER ELECTRONICS ASSOCIATION

INTRODUCTION

The Consumer Electronics Association (CEA) thanks Chairman Thune and Members of the Subcommittee for the opportunity to present its views on electronic waste.

CEA represents more than 2,000 companies involved in the design, development, manufacturing, distribution and integration of audio, video, in-vehicle electronics, wireless and landline communication, information technology, home networking, multimedia and accessory products, as well as related services that are sold through consumer channels. CEA also produces the nation's largest annual event, the International Consumer Electronics Show.

By extending information and entertainment to everyone—regardless of income or geographic location—our products have improved lives and changed the world. Meanwhile, America stands as the global leader in innovation, ingenuity and creativity.

In addition, the competition and falling prices characteristic of our industry continue to confer benefits to consumers. As our products become increasingly affordable, it is often more economical for consumers to replace a product with a new one rather than repair older equipment.

While these displaced products may have reached the end of their lives or be out-of-date, they are definitely too valuable to be completely discarded. Most consumer electronics products contain valuable materials such as precious metals, plastics and other raw materials that can be resold in the commodities market by recyclers. Moreover, used, working computers can find use in thousands of schools, charities

and public agencies committed to training people with disabilities, students at risk and economically disadvantaged Americans.

In fact, CEA recently joined eBay's Rethink Initiative, which brings together leading technology companies, government agencies, environmental groups and millions of eBay users to confront the problem of electronic waste (e-waste). Rethink's members offer consumer education via comprehensive information on options available to reuse or responsibly recycle, as well as disposition tools such as assisted selling, convenient local drop-off, trade-in programs and charity donations.

CEA SUPPORTS A NATIONAL APPROACH TO E-WASTE MANAGEMENT

The Consumer Electronics Association strongly supports the development of a national framework for e-waste management. The current de-facto system for e-waste is an evolving patchwork of state-by-state approaches. This conflicting, ad-hoc approach imposes unnecessary burdens on technology companies and consumers alike. E-waste is a national issue that should have a national solution.

A national end-of-use framework would apportion responsibility and ensure a level playing field among stakeholders, while promoting a widespread and adequately financed e-waste solution.

In addition to the development of a national e-waste framework, CEA believes the following elements are worthy of consideration:

1. Tax Credits

The federal government should support states choosing to rely on effective market-based solutions. Federal tax credits can enable manufacturers, recyclers, and retailers to offer recycling services in those states. Tax credits also may enable stakeholders in other electronics sectors to offer recycling services or to develop markets for recycled products. Tax credits should be available to all stakeholders involved in the end-of-life infrastructure, including retailers to help defray costs in those states adopting visible fee-based systems.

2. Fostering Design for Environment

The principal responsibility of manufacturers of display devices lies in product design. CEA supports the creation of reasonable federal procurement policies based on environmental criteria. The market power of the government can play a significant role in providing a direct sales-based incentive to manufacturers. States can augment this by adopting federal environmentally sensitive procurement guidelines, increasing the market and the incentive for manufacturers. Federal and state governments will capture cost-savings through reduced energy usage and other advantages offered by these products.

3. A National Recycling Third-Party Organization

States considering advanced recovery fee or "ARF"-based systems may opt to select a third-party organization ("TPO") to collect and administer recycling funds. CEA will support the creation of a national TPO, both to assist states considering a TPO system and to provide a national clearinghouse for consistent product scope to ensure stable harmonization of state-level systems. A national TPO should include manufacturers, retailers, and recyclers in its governance structure. TPO creation and availability to states can serve as a further incentive to create state-level systems complementing a national solution. If additional federal authority to enable to harmonization is required, CEA will work with the U.S. Congress as appropriate to put that authority in place.

4. Ensuring a Level Playing Field Through Federal Policy

The role of the federal government lies primarily in ensuring a level playing field nationally for recycling stakeholders complying with state-level recycling systems. The federal government should put measures in place that enable states to ensure a level competitive playing field for in-state retailers with Internet and out-of-state retailers. CEA supports any required additional federal authority to ensure interstate compliance with state-level market-based or visible fee-based systems.

CONCLUSION

Finding a solution to this public policy challenge is a priority for CEA. As we continue to make strides in eco-friendly design initiatives, lead the consumer electronics industry on environmental issues and be a part of the effort to educate consumers about e-recycling, CEA hopes to work with Congress and all interested parties to reach a common-sense, national solution that makes recycling as convenient as possible for all Americans.

STATEMENT OF BILL SHEEHAN, PH.D., DIRECTOR, PRODUCT POLICY INSTITUTE

Thank you for the opportunity to provide comments to the Senate Subcommittee on Superfund and Waste Management hearing on the problem of electronic waste disposal. The Product Policy Institute is an independent nonpartisan research and education organization that focuses on the link between production and consumption, on the one hand, and waste generation and disposal, on the other, in order to promote public policies that encourage sustainable practices. We believe that the policy approach of extending producer responsibility for end of life management of electronic waste offers the most effective solution to the problem of electronic waste management, because it relies on market forces and incentivizes fundamental solutions upstream at the design stage..

Extended Producer Responsibility (EPR) is a policy principle to promote total life cycle environmental improvement of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product. EPR policies shift part, or all, of the responsibility for the end-of-life management of products and packaging from tax payers and waste management authorities to those who design the products and packaging—the manufacturers. Manufacturers have the largest opportunities to reduce lifecycle environmental and health impacts, because the design phase of the product chain is the most critical to reducing waste. Moreover, local public authorities do not have the resources to safely manage e-waste.

EPR policies appeal to both conservative and liberal political perspectives. From a fiscal conservative perspective, EPR makes sense because it gets waste management off the tax base and it is based on the notion that the market will drive programs that are more efficient than government managed programs. Those of a more liberal bent support EPR because they believe that producers should have responsibility for pollution prevention. In several European countries and Canadian provinces, EPR regulations have been implemented, maintained or strengthened by conservative governments.

In our opinion, the most critical step in solving the "e-waste problem" using the market-based approach is establishing optimal roles for government and industry. The key is to ensure that government's role is focused on setting performance standards in the public interest and enforcing agreed outcomes that create a level playing field. When correctly designed and implemented, EPR policies can provide an alternative both to traditional bureaucratized command-and-control mode of environmental regulation, on the one hand, and to radical deregulation and privatization, on the other. Such policies allow regulated parties and other affected groups a greater share in shaping the rules under which they operate and permits a certain degree of self-regulation.

In North America, this approach is best developed in the Canadian province of British Columbia, where regulations allow brand-owners to develop their own EPR programs for a range of products, as long as they meet approval of the province. Targeted products never come through the municipal waste management system. British Columbia has applied this approach to beverage containers and household hazardous waste products, and is expected to shortly include electronic waste in the system.

Maine's e-waste law comes closest to EPR in the United States. Maine's law leaves significant collection responsibility to the municipalities, but overall Maine's approach is a strong step forward in the right direction.

We append to these comments a checklist of elements for effective EPR programs developed from a variety of sources. These are intended to apply to a range of products and packaging beyond electronic waste, but were developed with electronics in mind. We note several elements here.

- A key objective is to transfer costs of product waste management from taxpayers to producers and users, so that more efficient designs are rewarded in the market. Thus, tax credits alone are unlikely to solve the problem of e-waste.
- Competition is critical to making a market-based system work. Consequently, individual producers should be clearly assigned responsibility for results, even if given a choice to join a collective, third-party recovery system. Legislating a third-party monopoly is dangerous, as is direct government participation in managing such third party organizations. If government shares governance of such organizations, it becomes too easy to blame government for inefficiencies and failures.
- Bans on landfill disposal and other inappropriate forms of disposal like incineration and exporting to countries with inadequate safety regulations are essential to effective EPR programs. If these options are available to producers, there is little incentive to recycle responsibly.

We believe that advanced fees charged to consumers may be appropriate in the short term as a fair way of dealing with historical waste. But fees do nothing to influence product design, so should not persist beyond the initial period.

We also append to these comments a recent report by the Product Policy Institute comparing the development of EPR policies in the United States and Canada. Canada is instructive to look at. Canadians have progressed beyond debating whether EPR is a good idea, to figuring out how to implement it. Besides being our neighbor, Canada displays a diversity of EPR models being tested at the provincial level.

Thank you for taking up the critical issue of electronic waste management. We hope these comments are useful in your deliberations.

For publication in *Governance and Sustainability: The Case of Integrated Product Policy*, edited by Dirk Scheer & Frieder Rubik. Heidelberg, Germany (2005)

Extended Producer Responsibility Policies in the United States and Canada: History and Status

Bill Sheehan and Helen Spiegelman[1]

1 Introduction

This paper surveys the historical context and current status of Extended Producer Responsibility (EPR) policies in the United States and Canada, especially those focusing on end-of-life product management, and comments on the governance process involved in implementing EPR in the two countries.

EPR is "a policy principle to promote total life cycle environmental improvement of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product" (Lindhqvist 2000). EPR policies shift "part, or all, of the responsibility for the end-of-life management of products from tax payers, waste management authorities and conventional waste dealers to manufacturers," with the aim of encouraging "manufacturers of products to reduce environmental impacts across their entire life cycle" (cf. Tojo *et al.*, in this volume). For the purposes of this discussion, we consider EPR as a "policy principle" rather than a "policy instrument" (*ibid.*); accordingly, we cover a range of instruments ranging from legislated programs and negotiated agreements to purely voluntary initiatives by industries. Most of the instruments discussed shift responsibility in one way or another for the end-of-life management of designated products from local communities, where it has resided for over a century, to the products' producers.

In both Canada and the US, regulation or the threat of regulation has prompted a number of preemptive voluntary EPR initiatives by producers, including some examples of product redesign and limited product take-back schemes. There have also been protracted "multi-stakeholder" negotiations initiated by governments aimed at establishing mutually agreeable industry-funded

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or industry-operated programs for certain products. In the US these negotiations have been inconclusive for the most part to date; however several groups continue to provide venues for such policy discussion. In Canada on the other hand, multi-stakeholder negotiation has proven to be an effective way to arrive at regulatory programs that have been supported by industry. Canadian initiatives have been directed mainly at end-of-life management, while US concern, especially among environmental non-governmental organizations (NGOs), has also been directed at toxics reduction in product design (Thorpe 2003; CPA 2004). US and Canadian EPR programs are of special interest because they apply, in some cases, to product categories seldom addressed by other countries – such as paint, domestic pesticides, pharmaceuticals, fuels and flammable liquids.

2 North American waste policy: historical context for EPR

Like Europe, North America experienced a public health crisis when industrialization gave rise to large, densely populated cities with a laissez-faire approach to sanitation. In the late 19th Century a broadly focused social reform movement (Progressivism) put pressure on local governments to provide, among other things, public sanitation services. A measure of the movement's success is that universal collection and disposal of "municipal" waste became one of the core functions of local government (Melosi 1981; 2000). But over the course of the 20th Century, "municipal" waste changed significantly in composition. At the dawn of the 20th Century North American households threw out mostly coal ashes (Melosi 1981; Morse 1908). They now throw out mostly consumer products and packaging (US EPA 2003). **Figure 1** compares the composition of municipal waste in 1906 and 2001.

While municipal waste was changing, municipal infrastructure for managing it changed little except in scale (US EPA 2004b, para. 4). Technologies and approaches that served the purpose at the beginning of the century proved unsuited to the discards of a modern industrial society (Melosi 1981, p.193). In the 1970s tens of thousands of chemically contaminated sites were disclosed in the US. Strong federal legislation, referred to as the "Superfund" Act, authorized US EPA to mitigate the sites and seek financial compensation from the responsible parties (US EPA 2000). Twenty percent of the top priority Superfund sites were municipal landfills (Steinway 1999). In addition to causing toxic pollution, municipal waste handling practices resulted in large quantities of valuable materials ("secondary resources") being kept from further use by burial in

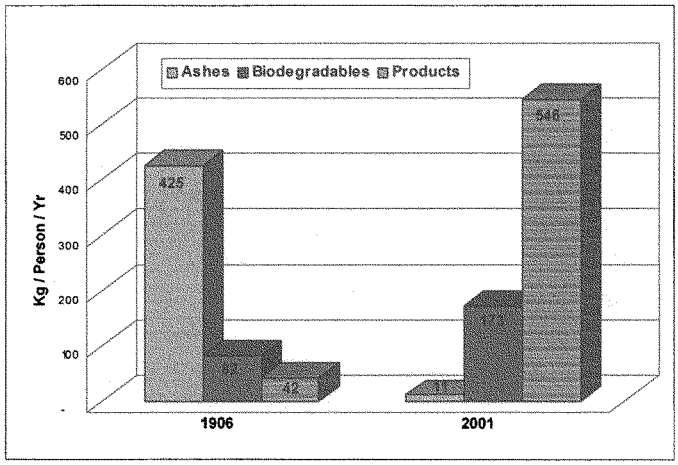

Figure 1 **US municipal waste - 1906 versus 2001.** (Sources: Morse 1908; EPA 2003)

landfills or destruction in waste incinerators. During the 1980s environmental organizers helped local citizens mount successful campaigns against proposed incinerators, citing environmental and health concerns. These citizen efforts, like those of a century earlier, were successful and many cities and towns implemented curbside recycling programs instead of waste-to-energy plants (Seldman 1995). In the late 1980s and early 1990s municipal recycling programs expanded rapidly across the US and Canada. The quantity of discarded products recovered for recycling in the US, mainly through municipal efforts, increased from 14.5 million tons in 1980 to 46.2 million tons by 1995, representing 10% and 26% of total waste arisings, respectively (US EPA 2003). However, in the mid 1990s improvement in municipal recycling leveled off, a trend that continues to the present. Increases in recycling were matched by increases in the amount of wastes generated in the first place, offsetting gains in waste reduction (Spiegelman & Sheehan 2004). US EPA noted that the design of products was a challenge to municipal recycling, citing the example of plastics, which: "contribute substantial tonnage [of municipal waste], but are often in products such as appliances or furniture where recovery is difficult if not impossible" (US EPA 1999). As discussed below, policy makers in the US and Canada began to recognize that local governments did not have the resources to effectively manage certain waste streams. Senior governments, especially in Canada, stepped in to provide programs and, later, legislation aimed at extending producer responsibility to include product take-back and recycling.

3 Extended Producer Responsibility in Canada

The report "Our Common Future" by the World Commission on Environment and Development (WCED 1987) had a significant impact on environmental policy in Canada, both in the country's policy agenda and in its policy-making process. At both the federal and provincial levels, governments formed multi-stakeholder "round tables" on the environment and the economy (BC RTEE 1994). These round tables were a Canadian example of the non-hierarchical political steering process termed "governance" (cf. Mayntz in this volume). One such round table, established in 1989, was the National Task Force on Packaging. It was chaired by Environment Canada (a federal government agency) and included representatives from other levels of government as well as industries that use packaging, the national consumers association and the environmental movement. The packaging task force developed a National Packaging Protocol (NaPP), which was subsequently adopted by the Canadian Council of Ministers of Environment in 1990. NaPP established six packaging principles, three milestone targets and the goal of reducing total packaging waste in Canada by 50% by the year 2000 (CCME 1990). The NaPP initiative was widely viewed as a success when the 50% reduction target was reached in 1996 (CCME 1996). However, self-congratulation by industry provoked criticism from environmentalists because most of the reduction occurred in transport packaging rather than the consumer packaging that becomes a public cost burden in municipal waste systems (Morawski 1999).

In addition to this nationally negotiated EPR initiative, Canadian provinces began actively pursuing product-focused EPR policies, also using a multi-stakeholder consultative process. In Canada, the terms "Product Stewardship"[2] and "Industry Product Stewardship" are often used interchangeably with "Extended Producer Responsibility" (Environment Canada 2004a). Environment Canada has adopted the definition of EPR used by the 30-nation Organization for Economic Cooperation and Development: "an environmental policy approach in which a producer's responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product's life cycle" (OECD 2001). The province of British Columbia defines its policy of "Industry Product Stewardship" as follows: "a waste management system based on the principle of user-pay, whereby responsibility for materials and products in the

[2] A different usage developed in the United States, as is discussed in Section 4.3 below.

waste stream is borne by producers and consumers rather than general taxpayers" (BC MWLAP 2002).

Today all ten of Canada's provinces have regulatory EPR programs in operation and there are also several nation-wide as well as regional EPR initiatives that are voluntary. Canadian EPR programs are summarized in an inventory conducted by the federal environmental agency (Environment Canada 2002, 2004b).[3] As of 2004, thirty-two of the programs were supported with legislation, twelve were voluntary initiatives by producers, and four were under development. All Canadian EPR regulations are enacted at the provincial level. This has resulted in a patchwork effect, which industry associations have tried to address through nationally coordinated negotiations with government. For instance, the Canadian Petroleum Products Institute (CPPI) developed a model program for used oil and oil-related products that has been approved by four provinces (CPPI 2003). The Information Technology Association of Canada (ITAC 2004) formed Electronics Product Stewardship Canada and has published a plan for addressing e-waste in Canada (EPSC 2004). **Table 1** provides an overview of Canadian EPR programs.

3.1 Provincial EPR programs (West to East)

BRITISH COLUMBIA (pop. 4.1 million[4]). Canada's westernmost province, British Columbia (BC), has more extensive experience with EPR than any other jurisdiction in North America (Driedger 2002). In 1970 BC was the first jurisdiction in North America to implement a mandatory deposit-return program for soft drink and beer containers (BC MWLAP 2004a). The Litter Act required retailers to take back empty containers and issue refunds and successfully diverted the majority of designated containers from roadsides and public waste systems. In 1990 BC introduced government-managed recycling programs for tires and lead-acid batteries funded with excise taxes remitted to the provincial government by retailers (BC MWLAP 2004b). In 1992, retailers were required to take back used oil from consumers. These programs were similar to programs adopted by US states around the same time.

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[3] The inventory was first done in 1999, a major update was done in 2002, and additions are added occasionally to the website (Bury 2004).

[4] Canadian population figures are for the year 2000 (Statistics Canada 2003).

Table 1 Canadian EPR Programs Funded in Whole or in Part by Producers & Consumers (SOURCES: Environment Canada 2002, 2004b, CATRA 2004, Usedoilrecycling.com 2004, Alberta Environment 2004, Brewers of Canada 2003, Rechargeable Battery Recycling Corporation 2004)

PRODUCT GROUP	PROVINCE									
	BC	AB	SK	MB	ON	QC	NS	NB	NF	PE
REGULATORY PROGAMS										
Drink containers[5]	PRO1	PRO2	PRO2			PRO2	PRO2	PRO2	PRO2	PRO2[6]
"Blue Box" products [7]				PRO2	PRO2	Dev				
Used oil	PRO1	PRO2	PRO2	PRO2	Dev	Dev	Ret	Ret	Ret	Ret
Oil containers & filters	PRO1	PRO2	PRO2	PRO2	Dev	Dev				
Tires	Gov [8]	PRO2	PRO2	PRO2	Dev	PRO2	PRO2	PRO2	PRO2[9]	Gov
Lead-acid batteries	Gov [10]									Ret
Paints	PRO1					PRO2	PRO2			
Solvents/Flammable liquids	PRO1									
Gasoline	PRO1									
Domestic pesticides	PRO1									
Pharmaceuticals	PRO1									
Electronics		PRO2[11]			Dev					
VOLUNTARY PROGRAMS										
Milk [12]		$	$				$			
Beer containers [13]	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1
Agricultural pesticides/containers [14]	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1
Pharmaceuticals[15]		PRO1								
Rechargeable batteries [16]	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1	PRO1

KEY: **PRO1** = program designed and managed by brand-owners through their own Producer Responsibility Organization (PRO); **PRO2** = program designed and managed by a PRO established in regulation; **Gov** = program managed by provincial government; **Ret** = retailers required to take product back; **Dev** = under development. **$** = industry voluntarily subsidizes public recycling program.

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[5] Quebec's program is for beer and soft drinks only. Other provinces have deposit return requirements for all beverages except milk and milk substitutes.

[6] PEI also requires beer and soft drinks to be sold in refillable bottles.

[7] Producers required to provide partial funding for municipal multi-material recycling programs

[8] The BC Ministry of Water, Land and Air Protection manages the program. Retailers collect tire levies from consumers and remit those funds to the government.

[9] Retailers pay levies per tire sold to a crown agency that provides recycling.

[10] Similar to BC tires.

[11] Program managed by Alberta Recycling Management Authority

[12] The dairy industry subsidizes municipal or depot collection in these provinces.

[13] The Canadian beer industry operates a voluntary deposit return program across Canada. See www.brewers.ca

[14] Program with 50% funding from industry (CropLife). See http://www.ec.gc.ca/epr/inventory/en/DetailView.cfm?intInitiative=68

[15] Operated by the Pharmacists Association of Alberta

[16] Program funded by industry (RBRC). See http://www.rbrc.org/index.html

Starting in 1993, BC began to develop policies based on the principles of EPR. The BC Waste Reduction Commission recommended an approach to managing household hazardous waste (HHW) that would shift responsibility from general taxpayers to the producers of household hazardous products (BC WRC 1994). Subsequently, the BC government brought in a series of landmark regulations.[17] Requiring brand-owners or first importers of the most common HHW products (paint, flammable liquids, pharmaceuticals, and household pesticides) to develop "stewardship plans" for taking back and treating residual products and empty containers in accordance with the pollution prevention hierarchy (reduce, reuse, recycle, etc.). Those regulations then became the model for a revised regulation on beverage containers that replaced the retail return provisions in the 1970 Litter Act and expanded producer responsibility to all beverage products except milk and milk substitutes. More recently, a regulatory review process resulted in the replacement of BC's EPR regulations in a single regulation, the Recycling Regulation, which was adopted in 2004. It provides a common framework for producer stewardship of the previously regulated products and also creates a framework for introducing additional product categories. For example, consumer electronics are expected to be brought under the new regulation in the near future (Murray 2003).

Under British Columbia's EPR requirements an affected brand-owner can comply in any of three ways: by submitting its own EPR plan, by joining an association (variously referred to as a "stewardship agency," "third party organization," or "producer responsibility organization" [PRO]) that implements an approved EPR program, or by operating a stewardship program according to prescriptive requirements set out in the regulation. To-date all brand-owners have chosen to join producer responsibility organizations.[18] These industry PROs typically finance their programs with levies that are set by the PROs and charged to consumers at the point of sale. PROs are required to make annual reports to the government on financial and material flows. Under the regulation the ministry may establish committees of up to 12 persons to provide advice on whether to approve stewardship plans. The new Recycling Regulation requires all programs to establish and achieve recovery targets. The industry-initiated PRO is unique to British Columbia. In other provinces PROs are established through regulation, by government or by a crown agency. For this reason, British Columbia EPR programs resemble voluntary programs except

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[17] Paint Stewardship Program Regulation (BC Reg. 200/94); Residuals Stewardship Program Regulation (BC Reg. 111/97);

[18] There are three PROs for different beverage types (the beer industry PRO is Brewers Distributors Ltd.; the wine and spirits PRO is the BC Liquor Distribution Branch of the provincial government; the non-alcoholic beverage PRO is Encorp Pacific (CANADA). The HHW products are managed by Product Care and the BC Used Oil Management Association, and pharmaceuticals by the Post-Consumer Pharmaceutical Stewardship Association.

that they are required to report to government and to meet environmental performance standards.

ALBERTA (pop. 3.0 million) Alberta, the province directly to the east of British Columbia, has EPR programs for beverage containers, tires, used oil, oil containers and oil filters, and, most recently, electronic products. Alberta's EPR programs are managed by PROs established by government and their powers and responsibilities are spelled out in regulations.[19] Alberta EPR programs are financed with advance recycling fees that are set either in legislation (e.g., AB Reg. 94/2004 Electronics Designation Regulation) or by the PRO. These recycling fees are charged to consumers at the point of sale. Additional fees can be charged by the PRO to registrants (brand-owners of designated products). In addition to these regulated programs, a voluntary EPR program for milk containers is operated by the Alberta dairy industry, which provides subsidies to municipalities and depots that recycle plastic milk containers.

SASKATCHEWAN (pop. 1.0 million). Saskatchewan, the province directly to the east of Alberta, has EPR programs for beverage containers, used oil, oil containers and filters, and tires. Saskatchewan's beverage container program is managed by a PRO which is a social service organization, Saskatchewan Association of Rehabilitation Centres Recycling Division (SARCAN). SARCAN operates under contract to the provincial government. The SARCAN program is funded in part with "environmental handling charges" levied by the government on beverages at the point of sale. SARCAN also manages empty milk containers, receiving subsidies from the dairy industry under a negotiated agreement with the Saskatchewan government. The oil and tire programs are operated by PROs similar to those in Alberta.

MANITOBA (pop. 1.1 million). Manitoba, the province located between Saskatchewan and Ontario, is one of only two Canadian provinces that do not have a mandatory deposit-return system for beverage containers (the other being Ontario). In 1995 the Manitoba Multi-Material Stewardship Regulation[20] established a 2-cent levy on soft drink beverage containers (later expanded to all beverages except beer and dairy) and created a PRO called the Manitoba Product Stewardship Corporation (MPSC). The MPSC's role is to disburse funds from the levy to municipalities, reimbursing them "on a theoretical 80/20 cost-share basis" for providing multi-

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[19] Thus, the Lubricating Oil Material Recycling and Management Regulation establishes the Alberta Used Oil Management Association; the Beverage Container Recycling Regulation establishes the Beverage Container Management Board; and the Designated Material Recycling and Management Regulation establishes Alberta Recycling Management Authority (this Authority currently oversees EPR programs for both tires and consumer electronics).

material curbside recycling. Manitoba municipalities are required to collect and recycle at least five designated products in order to be eligible for funding from MPSC. However it has proven difficult to disburse municipal funding equitably (MPSC 2004). In 1998 a PRO called the Manitoba Association for Resource Recovery Corporation (MARCC) received authorization[21] from the provincial government to operate an EPR program for oil, oil containers and oil filters. In that same year another regulation[22] formalized an existing government-run tire recycling program and established a PRO, the Manitoba Tire Stewardship Board, to manage it. As in Alberta, this government-established PRO is made up of appointees from the industry and the provincial government. In 2001 Manitoba proposed a new regulation under the Waste Reduction and Prevention Act that would make producers responsible for collection and treatment of household hazardous waste (HHW) including consumer electronics. However, the regulation has not yet been adopted.

ONTARIO (pop. 11.7 million). In the mid-1980s, Ontario was a leader in implementing municipal curbside recycling programs. Ontario's "Blue Box" program for collecting paper, bottles and cans was emulated by cities across North America. Uniquely, Ontario's curbside recycling program received funding from some of the producers of products collected for recycling. This was the result of an agreement between the Ontario government and the soft drink industry: the province would slash its refillable quota for soft drink containers on the condition that the soft-drink industry contribute $ 20 million over a five-year period to develop the Blue Box program (Menzies 1997). Over time funding from both industry and the provincial government was withdrawn and municipal governments were left sustaining what was becoming a costly program[23] (Menzies 1997).

In 2002, the Ontario Waste Diversion Act, established Waste Diversion Ontario (WDO), a permanent, non-government corporation whose mandate is to oversee the development of waste diversion programs for specific wastes as requested by the Minister of Environment (OME

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[20] Available at http://www.canlii.org/mb/laws/regu/1995r.39/20040802/whole.html

[21] A letter of approval was issued by the Manitoba Department of Environment in February of 1998, under section 7 of the "Used Oil, Oil Filters & Containers Stewardship Regulation" of the 'Waste Reduction and Prevention Act'. See http://www.ec.gc.ca/epr/inventory/en/DetailView.cfm?intInitiative=91

[22] The Tire Stewardship Regulation, see http://www.ec.gc.ca/epr/inventory/en/DetailView.cfm?intInitiative=101

[23] Producers (mainly soft drink companies) paid $41 million between 1985 and 1996 while municipal and provincial taxpayers contributed a total of $660 million to sustain curbside Blue Box recycling.

2004). To date, the Minister has designated four classes of products: "Blue Box Waste"[24] already being collected by municipalities, plus lubricating oil, tires, and most recently electronics (all of the latter programs are still under development). Companies selling Blue Box products in Ontario were required to register with an "industry funding organization" (IFO) called Stewardship Ontario by April 20, 2004, in order to fulfill their obligations under the Act. These companies are now required to contribute fees to Stewardship Ontario. The fees will pay for half of the municipalities' "net cost" (after deducting disposal savings and any recycling revenues) for recycling Blue Box Wastes. Ontario's EPR approach is predicated on the involvement of municipalities. Legislation adopted in 1994 requires all Ontario cities over 5,000 in population to provide residential curbside recycling of Blue Box materials[25] (OME 2004, p. 12). The proportion of system costs that brand-owners will cover for used oil, tires and electronics had not been determined by late 2004, but it is expected to be higher than half (Bury 2004).

QUEBEC (pop. 7.4 million). Quebec has had mandatory container deposit legislation for beer and soft drinks since 1984, with retailers responsible for taking back containers and issuing refunds. The program is managed by a government-established PRO called Recyc-Quebec. In 1999 Quebec adopted an Action Plan that imposes on municipalities "physical, economic, liability and informative responsibility" for achieving waste diversion targets (Environnement Quebec 1999). In December 2002, the Quebec legislature approved legislation (Bill 102) which transferred some of the economic responsibility to producers, establishing an EPR management structure similar to Ontario's. Producers will be required to subsidize municipal multi-material recycling programs by paying fees to an industry funding organization (IFO) that is approved by Recyc-Quebec. A separate IFO, Eco-Peinture, has been authorized under regulation[26] to collect fees and operate an end-of-life management program for paint. Under this program, brand-owners are not allowed to recover the "eco-fee" from consumers except through price increases (in other provinces, PROs charge recycling fees as a separate line-item.) Seventy percent of the paint collection is done by municipalities at their own cost, 30% by retailers also at their own cost. Collected paint is delivered to a processing facility managed by Eco-Peinture. In March

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[24] "Designated Blue Box Waste" means packaging and printed materials that are comprised of metal, glass, paper, plastics, textiles or any combination thereof but does not include packaging or printed materials used exclusively for packaging products during their shipment from their place of manufacture to their place of distribution in Ontario, and packaging that is intended for continued use as packaging by the consumer over a period of five years or more. See: http://www.ene.gov.on.ca/envision/land/wda/bluebox/rules2004.htm

[25] Regulation 101/94 required Ontario municipalities to collect five products (newsprint as well as glass, steel, aluminum and PET plastic food and beverage containers), plus two additional products chosen from a list of 12 products.

[26] Quebec regulation 655-2000. See http://www.ec.gc.ca/epr/inventory/en/DetailView.cfm?intInitiative=73

2004 a new regulation came into effect that will authorize a similar program for oil, oil containers and oil filters (Granda 2004). Quebec's paint and oil regulations establish recovery targets.

MARITIME PROVINCES (combined pop. 2.4 million). The four small eastern Maritime Provinces (Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland) have EPR programs for beverage containers, used oil/containers/filters, tires, lead-acid batteries and paint (not all Maritime provinces have programs in place for all of these products; see Table 1). In most Maritime Provinces EPR programs are administered either by the provincial government or by a crown agency that acts as a PRO (e.g., Nova Scotia Resource Recovery Board). The programs are financed with fees charged to consumers as a separate line-item at the point of sale. For beverage containers, only half of the container deposit is refunded; the rest is used by the PRO to subsidize other waste-related programs.

3.2 Discussion

EPR programs in Canada for end-of-life product recovery and recycling are well established. "In Canada, we are past the point of discussing whether EPR is a good policy approach," says Duncan Bury, Head of Product Policy at Environment Canada's National Office of Pollution Prevention. "There is enough of a track record of these operating programs that there really isn't any question whether this is an appropriate kind of policy. We're now at the point of discussing how to make it more effective" (Bury 2004).

After starting out with a negotiated approach to EPR in the early 1990s, Canada has been much more aggressive than the US in recent years in establishing regulatory rather than voluntary EPR initiatives. However, Canadian policy makes an important distinction between government *regulation* and government *management,* which is explained by Environment Canada: "Notwithstanding this high level of regulatory involvement, it is important to emphasize that few of the programs are actually managed or implemented by government agencies. Most of the programs in the inventory have evolved away from or have been designed from the outset to minimize direct government involvement in their management and operation" (Environment Canada 2004b.). This approach is most clearly realized in British Columbia, as is illustrated by that province's "Product Stewardship regulatory continuum" (**Figure 2**), which shows the BC government's intention of shifting primary responsibility for product waste management from government and taxpayers towards industry and consumers. Only scrap tires and lead-acid batteries remain under the old, government-managed model; eventually, they too are to be replaced with the producer responsibility model.

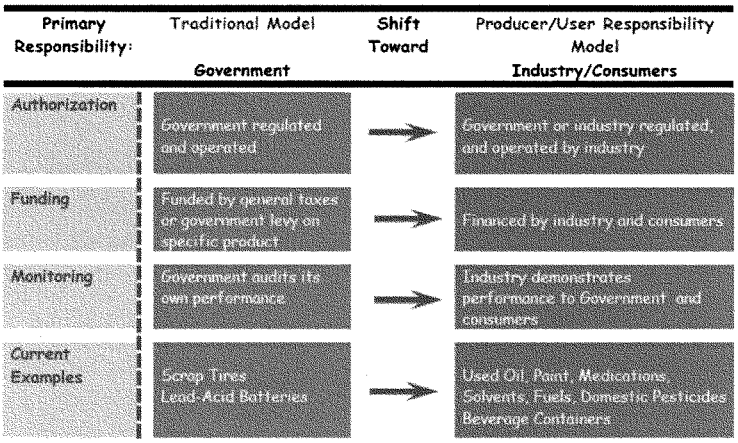

Figure 2 **British Columbia Product Stewardship regulatory continuum** (SOURCE: BC MWLAP 2002, p. 4)

BC regulations do not prescribe the system for managing a particular product type; rather they require brand-owners to develop an EPR program of their own and have it approved by the government. In theory, BC's regulation leaves the door open for new PROs to enter the market and for competition to reduce costs. If a new PRO can provide brand-owners with comparable take-back service at lower cost there is nothing to prevent a brand-owner from joining that PRO. However, to date BC PROs have operated monopolistically. The regulations of other provinces, on the other hand, establish PROs and define their powers, essentially prescribing what form the EPR program will take. Monopolistic PROs are quasi-governmental organizations that function more like public utilities than like businesses.

4 Extended Producer Responsibility (EPR) in the United States

EPR had a very different history in the US than in Canada. After a promising start with container deposit legislation in the 1970s and 1980s, and scattered state take-back legislation in the early 1990s, legislated EPR with physical or financial producer responsibility, transparency and accountability were absent until the environmental NGO community began to take charge of the agenda and organize public campaigns. We trace the development of EPR in the US chronologically, identifying three periods of roughly five years each.

4.1 Industry mobilizes against EPR (1988-1992)

Concern about solid waste was episodic throughout the 20th Century, but in the 1960s and 1970s alarm rose to a level that began to prompt federal government intervention in what was traditionally a local matter (Melosi 1981, pp.195ff). Federally mandated closures of municipal landfills and dumps during the1980s raised waste disposal costs significantly. Then in 1986 and 1987 two barges wandered the Atlantic Ocean in search of a place to dump their waste cargoes – one loaded with New York City garbage, the other with Philadelphia incinerator ash – and medical debris washed up on the New Jersey shore. National media coverage of these events raised public consciousness of waste issues and seemed to demand action.

As a result, the late 1980s and early 1990s saw a spate of federal and state legislative activity on waste issues (US EPA 2004c). Some laws mandated "manufacturer responsibility" (as "producer responsibility" was called then) but more legislation was aimed at increasing municipal responsibility. State legislatures imposed obligations on local governments to reach specified waste diversion targets by specified dates – typically between 25% and 50% recycling or waste diversion by the year 2000. For instance, 42 states and the District of Columbia enacted such goals which municipalities were expected to meet (Krause 2000). While municipalities invested in recycling programs, industry mobilized against increased manufacturer responsibility at both the state and federal levels.

Federal legislation for manufacturer responsibility was introduced in the early 1990s in both chambers of the US Congress. A national NGO, the Natural Resources Defense Council (NRDC), took the lead in lobbying for the federal bills, taking legislators to Europe to view first

hand early EPR developments there. The proposed National Recycling Act would not have mandated product take-back on the European or Canadian model; rather it focused on utilization standards that obligated producers to develop end markets. The Act would have given industry a menu of options for meeting targets (Lifset 1995). When the bill came near a vote in conference committee, the small NGO coalition was no match for overwhelming industry opposition. According to NRDC's Allen Hershkowitz, environmental NGOs had made a strategic error by including too broad a range of commodities in the legislation. The result was a broad spectrum of industry vehemently opposed to manufacturer responsibility (Hershkowitz 2002, 2004). They were already primed because they had fought and lost battles against recycled content mandates in US state legislatures and against EPR legislation in Europe. Moreover, environmental NGOs concerned about waste issues were not united around manufacturer responsibility as a priority at that time.

While federal legislators were considering national mandates, some states pursued manufacturer responsibility legislation of their own. Recycled content legislation, mostly for newsprint but also for plastic and glass containers and telephone directories, was adopted by at least 13 states, with another 15 states negotiating voluntary agreements (Lifset 1995). The "rates and dates" legislative model created by the Council of Northeast Governors was adopted widely, setting targets and deadlines for recycling of specific products. Several rates-and-dates bills also targeted packaging manufacturers, requiring the use of recycled content in the event recycling targets were not achieved. Such bills passed in California and Oregon, but in a major battle in Massachusetts rates-and-dates legislation was eventually blocked. After that the tide of state proposals receded (Lifset 2004).

The early 1990s was also a time when states passed product-focused take-back legislation addressing management of used oil, scrap tires and lead-acid batteries. Producer trade associations were successful in promoting model legislation that assigned responsibility to government, consumers or retailers – but not to themselves. For example, the American Petroleum Institute (API) promoted model legislation for used oil that utilizes state monies or consumer fees to finance state funds that are used to operate used oil collection facilities. Seventeen states have laws based on the API model.[27] Similarly, the Rubber Manufacturers Association was instrumental in getting 35 states to pass scrap tire legislation in which fees, collected from consumers by tire dealers in most cases, fund government managed tire

management programs.[28] Finally, the Battery Council International (BCI) successfully promoted legislation for collecting lead-acid batteries used in cars and trucks. Unlike regulations for used oil and scrap tires, lead-acid battery laws, which have been passed in 37 states, require retailers to take back used batteries (nine of those states require deposits on new batteries if an old battery is not turned in).[29] A common feature of the take-back programs for all three products is the absence of significant responsibility, either physical or financial, assigned to brand-owners.

4.2 EPR is co-opted (1993-1998)

After defeats in Congress and in Massachusetts, environmental NGOs turned away from legislating EPR. Several mainstream organizations turned instead to joint projects with industry.[30] The President's Council on Sustainable Development (PCSD), an industry-dominated forum established by President Bill Clinton in 1993, rejected EPR and promoted instead a "new paradigm" of voluntary, shared responsibility, which it called Extended *Product* Responsibility (Galeano 1997). Extended *Product* Responsibility was defined as "a *voluntary system* that ensures responsibility for the environmental effects throughout a product's life cycle *by all those involved in the life cycle*" (PCSD 1996, p. 40, *emphasis added*). The PCSD was successful in getting the US EPA to embrace the new concept (US EPA 1997), and key US academics participating in the PCSD also lent their support.[31] A PCSD stakeholder meeting on Extended *Product* Responsibility in late 1996 was conspicuous in the near absence of environmental NGOs.

At this time international experience with EPR as a waste-reduction policy was developing rapidly. In 1994 the Organization for Economic Cooperation and Development (OECD) began a series of international meetings aimed at developing guidance on EPR policies based on the experience of member states. The US participated in the OECD process but its position on

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[27] See http://www.recycleoil.org/apimodel.pdf ; http://www.recycleoil.org/backup/About_us.htm

[28] See https://www.rma.org/publications/scrap_tires/index.cfm?PublicationID=11121

[29] The only mention of producers in BCI's model legislation stipulates that that manufacturers shall *not* be required to label the plastic resin used in their battery casings. See http://www.batterycouncil.org/BCIMODEL.pdf

[30] For example, Environmental Defense Fund seized an opportunity created by the grassroots McToxics campaign and worked with McDonald's, starting the Alliance for Environmental Innovation; Hershkowitz and NRDC turned to developing a paper mill; National Audubon worked with McDonalds on composting (Lifset 2004).

[31] For instance, in 1994 Gary Davis of the University of Tennessee's Center for Clean Products and Clean Technologies organized a small conference in Washington DC attended by federal government officials and academics titled Extended *Producer* Responsibility (Wilt & Davis 1995). The next year, Davis coauthored with S. F. Galeano from Georgia-Pacific and F. H. Brewer from S.C. Johnson a proposal to the PCSD's Eco-Efficiency Task Force entitled "Extended *Product* Responsibility" (cited in Galeano 1997, p.C-11).

fundamental policy questions had begun to diverge from developing international norms. The US environmental NGO community had only a small presence at the OECD deliberations.[32] The final document of the OECD deliberations was a Guidance Manual for governments (OECD 2001) which directed responsibility more pointedly than in the American "Extended *Product* Responsibility" model. While the document acknowledged that responsibilities under EPR are "inherently shared" by retailers, distributors and consumers, it stated that "there should be a leader or focal point assigned to organize and undertake action" (*ibid.*, p. 12), and that "[r]esponsibilities should be well-defined and not be diluted by the existence of multiple actors across the product chain" (*ibid.*, p. 28). The first guiding principle of EPR policies and programs, the report noted, is "to provide producers with incentives to incorporate changes upstream at the design phase in order to be more environmentally sound" (*ibid.*, p. 27).

In the mid-1990s, following from the new US federal policy direction, there was a shift from state legislative initiatives to lax voluntary initiatives encompassing the entire North American market. Sometimes national programs superceded state mandates. For example, early in the 1990s, as proposals were circulating in Europe to ban cadmium in batteries, several states, including Minnesota and New Jersey, enacted manufacturer take-back requirements on nickel-cadmium (Ni-Cd) rechargeable batteries. In 1994, as the state take-back requirements were being phased in, the Portable Rechargeable Battery Association established a producer responsibility organization (PRO), the Rechargeable Battery Recycling Corporation (RBRC), to manage a program for the recovery and recycling of Ni-Cd batteries. RBRC launched the first industry-wide voluntary take-back program in the US (and Canada) and set a goal of 70% Ni-Cd battery collection by 2001 (Fishbein 1997, p.6-17). In 1998 RBRC moved the 70% recovery target to 2004 and stopped reporting capture rates (only the weight of batteries collected). Subsequently, RBRC simply stopped talking about rates altogether. By 2000, it was apparent that RBRC was grossly failing to meet the original targets it had set. The State of Florida, one of the few states to attempt to track environmental release of cadmium, calculates that the recovery rate of rechargeable batteries in 2003 was a mere 14%, and there was no reduction in the amount of cadmium discarded annually in rechargeable batteries between 1995 and 2003.[33] Using

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[32] Bette Fishbein of INFORM, a New York-based research and advocacy organization, attended the OECD meetings on EPR and documented the "debate" over shared responsibility and also the aversion of US industry participants to placing any responsibilities on brand-owners for end-of-life product management (Fishbein 1998, 2000).

[33] John L. Price, Florida Department of Environmental Protection, Hazardous Waste Management Section, based on 2003 data from the International Cadmium Association. Personal communication with Bill Sheehan November 4, 2004. Tonnages are reported at

RBRC's own figures, INFORM estimated that the 2000 capture rate for Ni-Cd batteries was around 10% (Valencia 2002; see also NRDC 2003), and even that estimate may conflate industrial cadmium recycling that existed prior to RBRC's formation (Valiante 1999). But the legislative pressure was off in the US, and the European Union was retreating from banning cadmium. In the face of an extensive RBRC advertising campaign aimed at consumers, few people questioned the effectiveness of the program or complained about the lack of transparency or accountability. RBRC has been touted in the US as a successful example of voluntary industry EPR. It was used, for example, as the model for as similar initiative by the National Electric Manufacturers Association to establish a PRO, the Thermostat Recycling Corporation, to recover mercury-containing thermostats (NEMA 2004). Like RBRC, TRC has no recovery targets and lacks transparency or accountability.

4.3 Environmental NGOs put EPR back on the US agenda (1999-2004)

Activity by US state and federal governments continued to focus around voluntary and negotiated initiatives as the 20th Century drew to a close. The term "Extended *Product* Responsibility" was gradually phased out and replaced by the term "Product Stewardship" by the end of the 1990s (Lindsay 2004). The Minnesota Office of Environmental Assistance (MOEA) was one of the early promoters of state-level Product Stewardship programs, networking extensively with other state agencies. MOEA's Product Stewardship principles strike a compromise between amorphous "shared responsibility" and focused producer responsibility by stating: "The greater the ability of a party to influence the life-cycle impacts of the product, the greater the degree of responsibility the party has for addressing those impacts" (MOEA 1999). Two other organizations that work closely with state regulators are the Northwest Product Stewardship Council[34] (founded in 1998) and the Product Stewardship Institute[35] (founded in 2000). These organizations have also been attempting to negotiate voluntary product initiatives with industry. Along with the MOEA, they receive support from US EPA. Their priority products

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http://www.dep.state.fl.us/waste/quick_topics/publications/shw/hazardous/FINAL2004HazardousWasteManagementNeedsAssessment.pdf, page 62.

34 "The Northwest Product Stewardship Council is a group of government organizations that works with businesses and nonprofit groups to integrate product stewardship principles into the policy and economic structures of the Pacific Northwest." http://www.productstewardship.net/about.html

35 The Product Stewardship Institute is affiliated with the Lowell Center for Sustainable Production at the University of Massachusetts in Lowell. "PSI works with state and local government agencies to partner with manufacturers, retailers, environmental groups, federal agencies, and other key stakeholders to reduce the health and environmental impacts of

provide an indication of the range and scope of state and federal product-focused activity in the US (**Table 2**).

Initiatives promoted by these organizations focus on products with toxic components. Program descriptions tend to highlight voluntary initiatives by single companies rather than sector-wide efforts. They have limited geographic coverage, may involve one-off collection events and consumer-pay return systems. Moreover, transparency is limited and consequences are lacking for failed commitments.

Several product categories were the subject of intensive negotiations in the US during the early 2000s, most with inconclusive results. The National Electronics Product Stewardship Initiative36 (NEPSI) was a consultative process funded by US EPA that primarily engaged government and industry representatives. It was a response to European Union developments that eventually culminated in the 2003 Waste Electrical and Electronic Equipment Directive. NEPSI met for over three years (2001-2004) but disbanded without agreement. During the same period another multi-stakeholder process was addressing beverage container recovery, this time without direct government involvement. Businesses and Environmentalists Allied for Recycling (BEAR) met for two years, produced a report (BEAR 2002) and then disbanded without action. A third negotiation process, targeting carpet waste, did result in an agreement. Negotiations were initiated by the state of Minnesota's MOEA, funded by US EPA, and engaged state government officials and industry representatives from the geographically centralized US carpet industry. Negotiations led to a 2002 Memorandum of Understanding (MOEA 2002) and the establishment of a producer responsibility organization called Carpet America Recovery Effort (CARE 2004a). The carpet agreement requires reporting of sector-wide recovery data and has resulted in significant design innovation to make carpets more recyclable. However it contains modest goals (23-28% recycling and reuse by 2012), is not on track in meeting these goals, and lacks explicit consequences for failure to meet them.[37]

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consumer products. PSI takes a unique product stewardship approach to solving waste management problems by encouraging product design changes and mediating stakeholder dialogues. http://www.productstewardship.us/

[36] See http://eerc.ra.utk.edu/clean/nepsi/default.htm

[37] In the MOU, government signatories reserve the right to use "policy and regulatory tools as appropriate to bolster the agreement," but there are no explicit consequences for failure to achieve interim goals, other than that industry shall direct CARE "to develop a detailed analysis with specific recommendations." In its 2003 annual report, CARE reported that the industry had achieved less than a third (1.94%) of the 5.9% diversion goal for 2003 (CARE 2004b, p.4).

Table 2 Priority products for US state and federal governments, 2004
(SOURCES: websites listed below)

Priority Products	EPA	MOEA	NWPSC	PSI
Electronics (computers and TVs)	x	x	x	x
Mercury-containing products				
Thermometers	x		x	
Thermostats	x		x	x
Fluorescent lamps	x			
Vehicle components	x			
(Batteries)	x			
Batteries (portable)	x			
Medical products	x		x	
Carpet	x	x		x
Packaging	x			
Beverage containers	x	x		
Vehicles		x		
Tires			x	x
Apparel			x	
"Emerging products" [38]				
Paint	x	x		x
Pesticides	x	x		x
Building materials	x			
Radioactive materials	x			x
Propane tanks and gas canisters	x			x

US EPA = US Environmental Protection Agency: http://www.epa.gov/epaoswer/non-hw/reduce/epr/products/index.html
MOEA = Minnesota Office of Environmental Assistance: http://www.moea.state.mn.us/stewardship/index.cfm
NWPSC = Northwest Product Stewardship Council: http://www.productstewardship.net/products.html
PSI = Product Stewardship Institute: http://www.productstewardship.us/
Web sites accessed 12 November 2004.

In the absence of effective and enforceable industry solutions, US environmental NGOs re-engaged in the debate about producer responsibility in the late 1990s and played an increasing role in drawing public attention back to producer responsibility. This time it was not mainstream organizations based in Washington DC or New York that were active, but grassroots groups and networks dispersed around the country. They launched campaigns that focused on brand-owners – e.g., Dell and Coca-Cola – and on state legislation because they saw little hope of action at the federal level. They also forged contacts with European and Asian counterparts. For example, in 1999 several US environmental NGO representatives attended a European NGO strategy meeting which energized efforts to organize campaigns for computer and mercury EPR in the US. In 2003, a US-Canadian coalition of environmental, labor, health and

[38] "Emerging Products" category is from EPA's site.

environmental justice NGOs, called the EPR Working Group, developed a set of EPR principles consistent with international standards (EPRWG 2003).

The Mercury Policy Project, the Clean Car Campaign, Health Care Without Harm and other organizations organized North American NGO support for phase-outs and bans on new mercury-containing products and producer take-back for historical waste (i.e., products sold before bans were implemented). By mid-2004, many states had considered, and about a dozen passed, legislation requiring labeling or banning mercury in products ranging from thermometers to mercury-added novelty toys (US EPA 2004a). In 2001, Maine passed the nation's first take-back law for historical mercury-containing waste. Under the law, automobile manufacturers are required to label mercury-containing parts and must pay a bounty to auto salvagers that collect mercury-containing switches (Maine MPAC 2003).[39]

Meanwhile, the Computer TakeBack Campaign kept pressure on brand-owners and state legislators to find EPR solutions, acting as a counterbalance to industry efforts to keep end-of-life management cost burdens with municipalities as much as possible (CTBC 2004). In 2003 California enacted SB 20, a computer recycling law that failed to assign significant responsibility to brand-owners, instead establishing a government-run program funded with an excise tax. But the following year, the state of Maine enacted LD 1892 that required industry to take-back and recycle discarded computer monitors and TVs that will be collected by cities and towns. This was the first state take-back law for electronics to assign significant producer responsibility for end-of-life electronic products.

Recycling activists in the GrassRoots Recycling Network (GRRN) and Clean Water Action of New England focused on EPR as the most effective strategy to eliminate waste. In the mid-1990s GRRN launched a campaign that pressured the Coca-Cola Company to start using recycled plastic in its containers, and in 2002 helped draft, for beverage containers, the first modern federal EPR legislation, which was introduced into the US Senate (US Senate 2003). Also in 2002, Hawaii became the eleventh state to pass container deposit legislation – the first new state bottle bill in sixteen years.

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[39] Automakers pledged to phase out mercury in switches in 1995, had not done so by 2004 (see Clean Car Campaign 2004).

5 Governance

Mayntz (in this volume) suggests that "governance" could provide an alternative to either the traditional hierarchical, bureaucratized command-and-control mode of environmental regulation, on the one hand, or the radical deregulation and privatization exemplified by Thatcherism, on the other. Governance, Mayntz explains, arrives at better solutions because it allows the regulated parties and other affected groups a greater share in shaping the rules under which they operate and permits a certain degree of self-regulation. As we have seen, British Columbia EPR regulations allow brand-owners to develop their own EPR programs, as long as they meet approval of the province.

Thomas Lindhqvist has noted how EPR policies appeal to both conservative and liberal political perspectives. Indeed, negotiation may provide an opportunity for traditional policy adversaries to disaggregate each other's positions and forge solutions that contain the best of both sides. From a fiscal conservative perspective, EPR makes sense because it gets waste management off the tax base and it is based on the notion that the market will drive programs that are more efficient than government managed programs. Those of a more liberal bent support EPR because they believe that producers should have responsibility for pollution prevention. In Sweden, several Canadian provinces and elsewhere, EPR regulations have been implemented, maintained and strengthened by conservative governments. If public interest organizations can come to accept industry's hopeful view that markets, rather than bureaucratic planning, will be the source of solutions to our environmental problems, can the business community be convinced that regulation is necessary to engage the market in this problem-solving activity?

Mayntz cautions that effective governance "needs a sufficiently powerful state to motivate self-regulation which takes account of *public* [emphasis in the original] interests and does not only benefit the participating actors themselves." Governance, then, is "not so much the loss of state control, as a change in its form" (*ibid.*). Governance and self-regulation can only be evaluated in light of empirical results. To assess different approaches to EPR policy, the critical need now is for monitoring and meaningful targets. With increased reliance on voluntary initiatives and cooperative agreements to address environmental problems, little is known about their effectiveness. In part, this is a function of fundamental inattention to program evaluation and obstacles to evaluation inherent in voluntary programs (Harrison 1999). Moreover, in few cases have voluntary environmental approaches been found to contribute to environmental improvements significantly different from what would have happened anyway (OECD 2003).

Hence, the environmental effectiveness of voluntary approaches is questionable. On the other hand, many existing regulatory programs also lack explicit performance targets for evaluation, a deficiency that is now being addressed in British Columbia. As former US President Ronald Reagan said (in reference to negotiations with the former Soviet Union): "trust, but verify."

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Product Policy Institute

EPR CHECKLIST

A Checklist For Effective Extended Producer Responsibility Regulation*

Ultimate Objective	
1 Reduce Environmental Impacts During All Stages of Product Life-Cycles	
Intermediate Objective	
2 Encourage Product Redesign by Shifting Financial Responsibility for End-of-Life Management from Taxpayers to Producers (Brand-Owners)	
Elements	
3 Mandatory	Program is encoded in law so that all competing producers within a product category have to participate and meet the same high standards (level playing field and no free riders).
4 Broad Scope	Scope is defined broadly to embrace all products in a market sector, so as to not disadvantage certain actors. Program covers products already sold, products currently on the market, as well as future products. Legislation applies to all brand owners regardless of sales channels (including internet sales). Products are clearly defined.
5 Producers are Responsible	As the party that controls product design, producers (or first importers) bear financial responsibility for management of their products at their end of product lives.
6 No Cost to Taxpayers	Responsibility for waste management is shifted from general taxpayers to producers. If producers chose to engage local governments for collection or other services, it is done on a contractual basis.
7 Producers are Responsible Individually	Efficiency and continued innovation is encouraged by making individual producers legally responsible for achieving outcomes. Producers may elect to set up or join Third Party Organizations (TPOs) to fulfill their obligations.
8 Competition is Encouraged	Competition among service providers is encouraged. If producers elect to set up a Third Party Organization, then multiple TPOs are allowed and encouraged.
9 Producers Design Plans	Producers design their own clean production and product take-back plans to meet performance standards and deadlines set by government. Producers have flexibility to determine the most cost effective means of achieving desired outcomes with minimum government involvement. Plans must be approved by a government body according to clear criteria.
10 Programs are Transparent	Government ensures transparency of producer programs and requires regular verifiable reports of progress. Program development process is open and provides opportunity for input to all stakeholders.
11 Outcomes are Enforced	Programs focus on results, with consequences for failure to achieve specified outcomes, such as termination of the right to sell products in the jurisdiction.

Clear Performance Standards	Government sets clear performance standards in the public interest in the following six categories.
12 Collection and Re-use/Recycling Rates	Quantitative goals and timetables are set for collection and re-use/recycling of products expressed as a percentage of total products entering the market or the waste stream, from each producer. Reuse is encouraged before recycling. All consumers have reasonable access to product collection facilities.
13 Treatment Standards	Programs establish verifiable performance standards for recyclers, including reporting requirements, worker health and safety criteria, and penalties for violations. People are not exposed to toxic materials in their workplaces or their communities.
14 Historical Waste	Programs cover stockpiles of products sold and discarded prior to the effective date of the legislation, including those products whose brand-owners have gone out of business ("orphan waste").
15 Disposal Restrictions	Recovered products must not be landfilled or incinerated domestically and must be managed in accordance with international laws and conventions. Hazardous or unsanitary used products must not be exported from developed to developing countries either for disposal or for recycling.
16 Toxics Reduction	Rules clearly define harmful materials that need to be phased out by a set deadline. Phase-out takes priority over product take-back.
17 Labeling	Product labels are required which identify the brand-owner, describe hazardous material content, and tell the consumer how and where to dispose of the product.
18 Complementary Measures	Programs may be supported by complementary measures, including government procurement policies specifying product take-back, and specification of minimum recycled content or material reduction (dematerialization). Leasing systems are encouraged.

* EPR Essential Elements are a synthesis of EPR Working Group *Principles* (http://www.eprworkinggroup.org/), Computer TakeBack Campaign's *Essential Elements for [E-waste] Legislation*, (http://www.computertakeback.com/legislation_and_policy/essentials.cfm), and British Columbia's *Industry Product Stewardship Business Plan* (http://wlapwww.gov.bc.ca/epd/epdpa/ips/review.html)

STATEMENT OF SCOTT CASSEL, EXECUTIVE DIRECTOR, PRODUCT STEWARDSHIP INSTITUTE, INC.

COMMENTS RELATED TO NEPSI

Since the first multi-stakeholder NEPSI discussions in April 2001, significant progress has been made. PSI believes that the results of this multi-stakeholder dialogue, involving numerous meetings and conference calls, should be acknowledged and built upon, as even more stakeholders have become interested since NEPSI. PSI would like to emphasize that NEPSI participants agreed on the following:

1. *Electronic wastes present an environmental problem.*—None of the participants—including manufacturers and government officials—considered landfilling and incinerating these products as viable management solutions. Participants understood that we do not want to bury lead and other heavy metals for future generations to dig up, that the disposal of electronic equipment is akin to throwing jobs, resources, and economic value into the garbage can, and that environmental problems can result from improper management. In addition, much solid waste disposal is accomplished through incineration in waste-to-energy plants; the inclusion of electronic waste in the feedstock increases the emissions of toxics into our air.

2. *NEPSI's goal should be to develop a national solution.*—In the February 26, 2004, NEPSI Compromise Resolution, which PSI helped negotiate, participants agreed to the following: "it is the desire of the NEPSI group to establish a national system to collect, transport and process consumer electronics in a manner that is protective of human health and the environment, and one that is economically sustainable and market driven." State governments have been forced to develop their own legislation primarily because the electronics manufacturers have been split on the type of system needed to finance and manage electronic wastes.

3. *The cost of managing electronic wastes should be included in the purchase price of a new product.*—At the start of the NEPSI dialogue, manufacturers argued that all taxpayers should cover the cost of managing electronic wastes, and that government programs, funded by taxes, should be increased to pay for waste management programs. This was a non-starter for government agency officials. Industry officials then proposed that consumers be charged "end-of-life" fees to be assessed when a consumer returned an item for recycling. Again, government agency officials considered this solution a non-starter, since fees discourage recycling and encourage illegal dumping. Finally, industry officials agreed to some type of "front-end financing system" that would include the cost to manage the product at its end-of-life in the purchase price of the product. It is on this single point—the type of front-end financing system—that manufacturers have been unable to agree.

4. *The Scope of Products to be covered by an agreement was agreed to as follows:*

- TV/TV Monitors (cathode ray tubes [CRTs] and flat panels).
- Stand-alone computer CRT and flat panel monitors greater than 9 inches.
- Laptop/notebook computers.
- Computer Processing Units (CPUs).
- Small peripherals (mice, keyboards, cables, speakers)
- Consumer desktop devices (printers and multifunction devices).

5. *The financing system should be a "hybrid"—starting with an "advanced recycling fee" (ARF) and transitioning to a type of "cost internalization,"* in which the end-of-life management costs are included in the product purchase price, but invisible to the consumer (e.g., not a specified and visible fee). While all government NEPSI participants supported this system as a compromise to their preferred system, there were several other stakeholders who dissented. Government officials believe there is great merit in a system that internalizes all the system costs. However, recognizing that such a proposal was a non-starter for industry in NEPSI, agencies agreed to start with an ARF to pump quick funds into the development of badly needed infrastructure, then transition to an internalized financing system based on set criteria.

6. *The Hybrid system should allow for an equivalent alternative system.* The NEPSI resolution allows for a flexible alternative system that would permit individual manufacturer responsibility if a company could provide a level of service that is equivalent to the "base level of service" that the NEPSI group believed was needed for an effective collection and processing infrastructure.

7. *Standards are needed for electronics recyclers.*—The NEPSI group supported the creation of recycling standards to ensure the "environmentally sound management" of electronic wastes.

In addition to the above agreements among the multi-stakeholder NEPSI group, PSI was able to develop a consensus among the state and local government participants as to their legislative preferences on several other issues.

• Use a non-profit entity to manage system finances.—Government officials supported the development of an industry-led non-profit that would collect and disburse funds to pay for the collection, reuse, and recycling of electronic equipment. This organization could also contract for collection and recycling services, submit reports on system performance, and perform other administrative functions. These non-profit entities already operate in Canada and Europe to enhance the efficiency of product management systems. In addition, government agencies researched legal precedents that allowed private entities to manage funds created by a government program.

• *Develop performance measures for collection and recycling.*— Agencies believe that the group's focus should be on system performance, and that the logistics should be the role of the private sector, which has greater incentive to reduce costs. Government agencies believe that its role should be to establish performance goals, with multi-stakeholder input.

• Disposal bans should be preceded by a recycling infrastructure.— While disposal bans will help to create a market for recycling, they will create consumer frustration and enforcement concerns if there is no alternative to disposal. Disposal bans, however, work well when a recycling infrastructure is in place.

COMMENTS RELATED TO S. 510

With regard to S. 510, PSI welcomes the opportunity that the introduction of this bill gives to consider interim measures to improve the national system for recycling used electronics. Provisions within the bill that PSI considers valuable include:

1. Federal government agencies should ensure that federally procured electronics equipment is recycled. PSI suggests that government agencies develop purchasing specifications that include the cost of recycling unwanted electronics equipment in the purchase price of new equipment.
2. Requiring electronics recyclers to be certified according to standards that will promote environmental protection.
3. Preceding a disposal ban by an adequate recycling infrastructure.
4. Determining how national legislation can be consistent with the intent of current state electronics recycling laws.

Provisions that PSI believes require additional consideration include the following:

1. Although the proposed study will have significant value, the study of end-of-life fees should acknowledge the experience gained in the last 5 years of electronics collections, much of which was financed by such fees. End-of-life fees may play a minor role in a comprehensive collection and processing infrastructure, but as a general policy, they discourage recycling and encourage illegal dumping. While some consumers will be more than happy to pay such a fee, this is not a strategy to reach the levels of recycling needed to make a true environmental difference.
2. Some PSI members believe that tax credits could be an interim measure, or a supplement to a comprehensive system, and that they could only help an ailing electronics recycling infrastructure. However, many of our members are concerned that all taxpayers would finance tax credits for electronics waste management, and not just those who use the product. These members believe that it is not fair for all taxpayers to pay an equal share of the costs when some taxpayers use, and benefit from, more or higher quality electronic equipment than others. Tax credits will not provide an incentive for manufacturers to change their product design or find ways to reduce the end-of-life management cost of their products. In addition, these tax credits will not go to local governments, which are most burdened financially by waste management, but to recyclers.

State and local government agencies in NEPSI preferred that all potential collectors of electronic equipment be eligible to receive a set "incentive payment" based on the unit or weight of material collected. Such a payment would directly cover their costs, and would provide an incentive for retailers, charities, and other entities to contribute to the collection infrastructure so that the burden did not fall completely on local government. Further, this approach would be more convenient to consumers, who would have multiple points at which they could drop off equipment. We would not expect many consumers to save their receipts for a $15 tax credit.

3. PSI would like to consider the best ways to encourage reuse in the context of the legislation.

Let me again express PSI's appreciation to the Committee for spending the time necessary to understand this complex environmental issue, and to take action to-

ward resolving electronics waste management issues. I would urge the Committee to take advantage of the discussions that have already taken place and use them as a springboard for new ideas so that we can truly find a workable national solution that is amenable to all key stakeholders. Now that there are three state laws pertaining to electronics waste management, we need to work together to find a national law that will integrate these systems into a strong national electronics management system.

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION,
July 28, 2005.

Hon. JOHN THUNE, Chairman,
Subcommittee on Superfund and Waste Management,
Senate Environment and Public Works,
Washington, DC.

Hon. BARBARA BOXER, Ranking Member,
Senate Environment and Public Works,
Washington, DC.

Re: Testimony for hearing on electronic waste issues

Dear SENATORS: Thank you for recognizing that the disposal of electronic waste represents an unconscionable waste of resources and creates an unnecessary risk to human health and the environment. Our challenge is to create public policy that achieves appropriate recycling of electronic waste in an efficient and cost effective way.

The State of Maine was the second state to adopt an electronic waste law. Maine's program is a first-in-the-nation system in which responsibility for a comprehensive recycling program is shared by consumers, the public sector; and the private sector. It shifts away from the presumption that government alone is responsible for end-of-life management of solid wastes from households by assigning manufacturers direct responsibility for ensuring electronic waste is appropriately recycled.

Our experience in working with stakeholders to design and implement Maine's system has been very positive. Manufacturers and recyclers understand that the more responsibility and authority they are given to manage the recycling of their products, the more opportunity they have to develop innovations in product design, collection and recycling systems that can lead to financial gains.

The Maine program is a system that is fair and flexible while adhering to high environmental standards. It clearly defines roles, establishes accountability and provides incentives for private sector innovation and for "Smart Production", i.e., environmentally sustainable production without the need for a new, extensive public sector bureaucracy to manage the system.

If you choose to establish a national program, it should not be more costly to the consumer than any of the existing state programs. A national program that assigns end-of-life product responsibility to the manufacturers will reward "green design" and environmentally-sustainable production processes. Such producer responsibility leaves the private sector with the ability to apply its strengths in innovation and efficient systems management to recapturing the resources that are currently wasted every time an electronic product is thrown away instead of recycled, and it can do this without creating a new layer of bureaucracy.

One positive step that the federal government can take to support current State e-waste programs and to lay a strong foundation for any future national program is to adopt an import ban on products from overseas manufacturers that are non-compliant with electronic waste laws in the United States. This would level the playing field for U.S. manufacturers, against whom states can readily take enforcement action, while provide significant incentive to comply to foreign manufacturers with no physical presence in the United States.

Once again, thank you for understanding that our current e-waste management problem presents us with a great opportunity to effectively recoup wasted resources and prevent environmental degradation through application of "Smart Production" principles and appropriate end-of-life management.

Sincerely,

DAWN R. GALLAGHER,
Commissioner.

SB20 Report

Determination of regulated elements in discarded laptop computers, LCD monitors, Plasma TVs and LCD TVs

Hazardous Material Laboratory
California Department of Toxic Substances Control

December 2004

Table of Contents

Executive Summary
At the request of the DTSC Hazardous Waste Management Program (HWMP), the Hazardous Materials Laboratory (HML) arranged for the testing of selected waste electronic devices (e-waste) to determine the total and extractable concentrations of regulated elements for comparison with hazardous waste criteria. Four electronic product types (Laptop Computers, LCD Monitors, Plasma TVs and LCD TVs) were identified, and four devices of each product type (except for LCD Monitors where seven individual devices were examined) of various brands and models were collected by HWMP and submitted for analysis.

A protocol was developed to prepare these samples. Devices were dismantled individually, and components classified into millable parts [plastic casings; glass or plastic LCD panels; Cold Cathode Fluorescence Lamps (CCFLs); printed circuit boards [(PCBoards) without capacitors or batteries], and non-millable parts (capacitors, batteries, metal frames, rods, and other metal parts). The weights of all components were recorded. The entire PCBoards and LCD panels were ground to pass a 2mm sieve and mixed well. Representative sub-samples were digested using EPA Method 3050, or extracted using either the Toxicity Characteristic Leaching Procedure (TCLP), or the California Waste Extraction Test (WET). Data met Quality Assurance requirements. Results were extrapolated to the entire device based on relative weights and with the assumption that non-processed components did not significantly contribute any regulated elements. Because of this assumption, the reported results should be considered as minimum values.

Results indicate that all PCBoards exceeded the Total Threshold Limit Concentration (TTLC) for Copper (Cu), and the Toxicity Characteristic (TC) Limit for Lead (Pb). Plasma TV inner panels exceeded the TTLC, the TC Limit and the Soluble Threshold Limit Concentration (STLC) for Pb. Total Mercury (Hg) in CCFLs did not exceed the TTLC when the entire weight of the device was factored in. However, all CCFLs exceeded the Hg TTLC when examined as stand-alone lamps.

Introduction

At the request of the Hazardous Waste Management Program (HWMP), the Hazardous Materials Laboratory (HML) arranged for the testing of electronic devices as defined in the Electronic Waste Recycling Act of 2003 (SB 20/ SB 50, Sher), to determine the total and soluble concentrations of regulated elements for comparison with hazardous waste criteria in Title 22, Chapter 11, Article 3. Specific tests performed on the electronic devices were digestion with EPA Method 3050 followed by elemental testing, the Toxicity Characteristic Leaching Procedure (TCLP); and the California Waste Extraction Test (WET). The results of these analytical tests were compared to hazardous waste regulatory thresholds: the Total Threshold Limit Concentration (TTLC), the Toxicity Characteristic Limit (TC Limit), and the Soluble Threshold Limit Concentration (STLC), respectively.

Materials and Methods

Four Laptop Computers, seven LCD Monitors, four Plasma TVs, and four LCD TVs of different brands and models were collected by DTSC and submitted for analysis. Two of the Plasma TVs and all four LCD TVs were accompanied by a remote control tool. All devices were shipped to Sequoia Analytical Laboratories in Morgan Hill, California, where work was performed under contract # 02-T2409 with the oversight of DTSC.

Sample Preparation:

The Standard Operating Procedure (HML SOP#916-S) developed for this project is shown in Appendix A-1. In summary, each device was dismantled individually, and components classified into the following groups:

LCD Monitors and LCD TVs:

1) Printed Circuit Boards (PCBoards), without any batteries or capacitors
2) LCD panels
3) Cold Cathode Fluorescent Lamps (CCFLs)
4) Millable plastic components, plastic casings
5) Metal components (metal frames, rods, capacitors and other metal parts)
6) Batteries

Laptop Computers-Top part

1) PCBoards, without any batteries or capacitors
2) LCD panels
3) CCFLs
4) Millable plastic components, plastic casings
5) Metal components (metal frames, rods, capacitors and other metal parts)

Laptop Computers-Bottom part

1) PCBoards, without any batteries or capacitors
2) Millable plastic components, plastic casings
3) Metal components (metal frames, rods, capacitors and other metal parts)

Plasma TVs
1) PCBoards, without any batteries or capacitors
2) LCD outer panels
3) LCD inner panels
4) Millable plastic components, plastic casings
5) Metal components (metal frames, rods, capacitors and other metal parts)
6) Batteries

Remote Control Tools
1) PCBoards, without any batteries or capacitors
2) Millable plastic components, plastic casings

For the purpose of this phase of the study, only PCBoards, LCD panels (inner and outer, where present) and CCFLs were processed and analyzed. The remaining components were weighed and archived for possible future analysis. Table 1 shows the type/brand/model of each device tested, along with the weights of each component tested and the weight of the total device.

With the exception of CCFLs (which were processed according to SOP-914S, Appendix A-2), all components to be processed were cut into small pieces and ground using a heavy duty mill (Retsch, Model #SM-2000) to pass through a 2mm mesh sieve. The 2 mm sieve was used for all analyses (total concentrations, WET and TCLP) to maximize the amounts available for all analytical procedures. Milled samples were thoroughly mixed to achieve homogeneity before removing aliquots for testing.

Sample Digestion for Elemental Testing:

A one gram (1 g) representative sub-sample of the thoroughly mixed sample was digested using EPA Method 3050B, with repeated additions of nitric acid, hydrochloric acid and hydrogen peroxide until the digestion was complete.

Extraction Procedures:

Sub-samples were taken from the milled samples and were extracted using the TCLP and the WET to determine the leachability potential of regulated elements.

TCLP: An aliquot of the sample was extracted as described in EPA Method 1311. Samples (105 g) were extracted with an amount of extraction fluid equal to 20 times the weight of the sample. Extraction fluid #1, consisting of a mixture of acetic acid and sodium hydroxide at pH 4.93 +/- 0.05, was used, since the final pH of the samples after the addition of 1N HCl was <2.0. The extraction vessel containing the sample and the extraction fluid was agitated on a rotary shaker at 30 +/- 2 rpm for 18 +/- 2 hours at ambient temperature. The material in the extraction vessel was then filtered through a glass fiber filter (0.45 micron) and the liquid extract was preserved with nitric acid to 5% by volume until ready for digestion and analysis.

WET: Sample aliquots (50 g) were extracted with a citrate buffer solution (10 times the weight of the sample) at pH 5.0 for 48 hours in a mechanical shaker under anaerobic conditions. Mixtures were centrifuged, filtered through Whatman filter paper #42 and then

passed through 0.45 micron membrane filter. The extracts were preserved by acidifying with nitric acid to 5% by volume before digestion and analysis.

Analytical Procedure:
The above prepared samples were digested with nitric acid, hydrochloric acid, and hydrogen peroxide, as specified in EPA Method 3050B. The digestates were analyzed by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP–AES, Thermo Jarrell Ash, Model 61E), using EPA Method 6010B. According to this method, digested samples were filtered through 0.45 micron membrane filters, nebulized, and the resulting aerosol transported into the plasma torch. Emission spectra were produced by radio frequency, dispersed by the grating material and the intensities of the emission lines were measured by photosensitive devices.

Hg in CCFLs:
CCFLs were processed according to SOP-914S (Appendix A-2). Briefly, CCFLs were placed in plastic bags, frozen to minimize volatilization of Hg, crushed and homogenized. Aliquots (0.6 g) were analyzed for Hg by EPA Method 7471A.

Statistical Evaluation of Data
Arithmetic means, standard deviations and coefficients of variation (CV%) were computed for each group of devices. The upper confidence level (UL) for the mean (1-sided, 90^{th} percentile) was calculated assuming normally distributed data. Normality was also assumed in order to calculate the required sample size to detect a statistically significant difference between the mean and the relevant regulatory limit at a 95% confidence level. To determine whether a component (as a group) exceeded the regulatory limit, both the UL should be greater than the regulatory limit and the required sample size should be equal to or smaller than the sample size employed.

Results and Discussion

Data Management
The elemental concentrations measured in the processed portions of the devices were converted to concentrations in the entire device by using the relative weights (Table 1), with the assumption that the unmilled portion of each device (including batteries, capacitors and metal components) did not contain any of the regulated elements. Because of this assumption, the reported results should be considered as minimum values.

Analytical results are shown in Tables 2-5. All samples were analyzed for EPA Method 3050 concentrations, TCLP-extractable elements and WET-extractable elements, with the exception of two LCD PCBoards (samples LCD3 and LCD4) which were not extracted for TCLP analysis because of insufficient weight. These results are shown as not analyzed, "NA" in the respective tables. Data below the reporting limit are shown as not detected, "ND".

Tables 2-5 show results for individual samples plus the arithmetic mean (average) of all samples in the component group, the per cent coefficient of variation (CV %) and the upper confidence level (UL) for the mean (1-sided, 90^{th} percentile). Entries in bold face (individual

result, mean or UL) indicate results exceeding the respective regulatory thresholds (shown in the top row of the Table).

Quality Assurance

Quality Control (QC) results for Total Concentrations are shown in Appendix B (Table QC-I). Samples were digested and analyzed separately in seven batches. Samples of various components, such as Plasma TVs glass panel, LCD-TV panels and Remote Control PCBoards were used as Matrix Spikes and Matrix Spike Duplicates (MS/MSD). These samples were spiked with all the elements at 50 mg/kg concentrations, while the Laboratory Control Samples (LCSs) were spiked at the same level (50 mg/L) in de-ionized water. Plastic chip blanks were milled in between the actual samples to assess any carry over from high concentrations in samples. None of the elements were detectable in the plastic chip blanks indicating that the milling system was free of cross contamination. In all the batches, recoveries of LCS ranged from 85.4% to 106%. Recoveries in MS/MSD, however, varied from element to element because some of the elements such as Pb, Cu, Zn, Sb, Ba, and Ag were present at very high concentrations compared to the amount spiked. Nevertheless, overall recoveries ranged from 72.8% to 158% except for one batch in which recoveries from 39.2 to 184 % were observed, perhaps due to matrix interferences (Remote Control PCBoard sample).

All CCFLs were processed and analyzed for Total Hg in four batches. Samples were spiked at 2 mg/Kg (MS and MSD) but due to very high concentration of Hg in the samples, the MS and MSD were not recovered. LCSs were prepared by adding 8 ug/L in DI water; recoveries ranged from 88.0 to 101 %. Eight of the samples were processed in triplicate and one in duplicate. Results of the replicate analyses are shown on Table 5.

For WET-extractable elements, samples were analyzed in six batches with Method Blanks and LCSs. MS/MSDs were run on different samples such as two Plasma TV panels, one LCD TV panel and three LCD monitor panels (Appendix B, Table QC-II). These samples, and an equal number of LCSs, were spiked with all the elements at a concentration of 2 mg/L. LCS recoveries varied from 90 % to 110% and all Method Blanks were below detection. MS and MSD were recovered within the range of 68% to 118%. The recovery of Pb in one of the batches, however, was not reported because of the high concentration in the sample in comparison to the spiked amount.
WET-extracted non-CCFL samples were run in six batches for Hg. LCSs as well as MS and MSD were spiked at 200 ug/L. For all batches, LCS recovery varied from 92% to 99%, while MS and MSD recoveries ranged from 76% to 100%.

TCLP analysis was batched into five sets of samples with Method Blanks and LCSs (Appendix B, Table QC-III). MS/MSDs were performed on samples such as Plasma TV – PCBoard, LCD TV panel and a laptop LCD panel. Samples and LCSs were spiked at 0.8 mg/L with the seven regulated elements. None of the elements was detected in Method Blanks, and LCS recoveries ranged from 94% to 110%. MS and MSD recoveries varied from 76.2 to 115 %, except for Pb in one of the batches where the recovery was not reported due to high Pb concentration in the sample. Two batches of QC were analyzed for Hg and the

LCS and the LCD glass panel samples were spiked at 8 ug/L. The LCS recovery was 89.2% and 89.8%. MS and MSD recoveries ranged from 56% to 110 % with 20.4 % RPD.

Sample homogeneity
To assess the homogeneity of the samples subjected to analysis, one sample was run in duplicate and another was run in triplicate. Table 6 shows the individual results, their mean and relative percent difference (RPD) for duplicate analyses, and standard deviation and %CV for triplicate analyses. Triplicate analysis was performed on one sample (PlasmaTV3, outer glass) and the only elements above the detection limit (Cr and Cu) had %CVs equal to 22.4% and 25.5%, respectively. Pb was measurable in two of the replicates, but was below detection in the third replicate. Half of the detection limit was used in that case to generate the third measurement and the summary statistics (40.9% CV). Another sample (PlasmaTV1, outer glass) was analyzed in duplicate. The RPDs for Cu and Cr (the only elements measured above their detection limits) were 40% and 24%, respectively. The particular samples were selected a priori for replicate analyses, without prior indication of expected concentrations. Most elements were below detection or at very low concentrations, contributing to elevated %CVs.

In an earlier investigation, the same sample preparation and analysis techniques were used to measure regulated elements in discarded consumer electronic products (DTSC, 2004). To assess homogeneity and reproducibility of the processed samples in that study, several samples were analyzed in triplicate with satisfactory results. For the major elements in those products (Cu, Sb and Pb), the average CV% were 23%, 32% and 36%, respectively. The process, therefore, produces reasonably homogeneous results.

Total Concentrations
Table 2 shows the results for total concentrations in mg/Kg (extrapolated to the entire device using the relative weights of processed and non-processed portions) for all samples. Regulatory limits (TTLCs) are shown in the top row. It is clear that only a few elements (Sb, Ba, Cr, Cu and Pb) were consistently measured in all samples. Figures 1 and 2 show the mean and 90% UL for Cu and Pb, respectively, for each device and component, with the TTLCs shown for comparison. As shown in Figure 1, all PCBoards clearly exceeded the TTLC for Cu, with Laptop PCBoards and Remote Control PCBoards having the highest concentrations. All panels, on the other hand, had negligible Cu concentrations. Similarly, all Laptop PCBoards and Plasma TV inner panels exceeded the TTLC for Pb. The sample size provided adequate statistical power for these determinations, with the exception of the Remote Control PCBoards. In that case, although the UL exceeded the TTLC, additional samples would be required to confidently assess exceedences.

TCLP
TCLP results (mg/L extrapolated to the entire device) are shown in Table 3. Only Pb could be measured above the reporting limit. The Plasma TV inner panels and all PCBoards exceeded the TCLP for Pb (Figure 3) with adequate statistical power.

WET
Table 4 shows WET-extractable results in mg/L (extrapolated to the entire device). All samples were below the STLCs with the exception of the Plasma TV inner panels which clearly exceeded the STLC. The sample size provided adequate statistical power for these determinations.

CCFLs
Table 5 shows concentrations of Hg in CCFLs and in the entire device based on relative weights. Because of concerns regarding homogeneity of the sub-sample (small amounts, potential for Hg loss through handling) eight of the samples were analyzed in triplicate and one in duplicate. Table 5 shows all measurements. Whenever available, the mean of the three or two replicates was used to express Hg content. There was considerable variability in the replicate measurements with %CVs ranging from 7.6% to 72.6% and an average %CV of 39.1%. Nevertheless, the concentrations of Hg measured in all CCFLs were all above the TTLC of 20 mg/kg. The data indicate that whereas all CCFLs contain Hg above the TTLC (when the lamps are considered by themselves), these concentrations fall below the TTLC when expressed as part of the entire device.

Data Summary
Table 7 shows the various components that determine whether a device exceeds a regulatory criterion. It is clear that inner panels of Plasma TVs exceed all criteria for Pb. All PCBoards exceeded the TTLC for Cu, and many exceeded the TTLC for Pb. The sample size was adequate to make these determinations in all cases, with the exception of the TTLC for Pb in the Remote Control devices. The wide variability observed in that case would require a minimum of 11 samples to assess whether these devices exceed the TTLC.

Conclusions

Based on these data, the following conclusions can be drawn for the particular components tested:

- The CCFLs have high Hg content, exceeding the TTLC. If, however, the CCFLs are not removed but are disposed as part of the entire device, the Hg content of the entire device is below the TTLC.
- The glass panels of the LCD monitors and laptops and the (outer) glass panels of the LCD TVs contain negligible amounts of regulated elements, all below any criteria.
- The inner panels of the Plasma TVs clearly exceed the TTLC, the TC Limit and the STLC for Pb.
- The PCBoards contain the maximum amounts of regulated elements.
- The Cu content of PCBoards was above the TTLC in all devices tested.

References

SB20 and SB 50 (Sher), The Electronic Waste Recycling Act of 2003, http://www.dtsc.ca.gov/HazardousWaste/CRTs/SB20.html

DTSC 2004. E-waste Report. Determination of regulated elements in seven types of discarded consumer electronic products. Hazardous Material Laboratory, California Department of Toxic Substances Control, January 2004

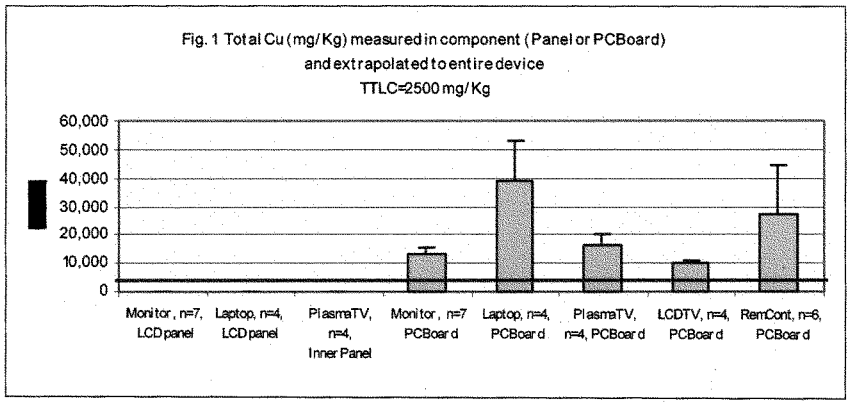
Fig. 1 Total Cu (mg/Kg) measured in component (Panel or PCBoard)
and extrapolated to entire device
TTLC=2500 mg/Kg
60,000
50,000
40,000
30,000
20,000
10,000
0
Monitor, n=7, LCD panel
Laptop, n=4, LCD panel
PlasmaTV, n=4, Inner Panel
Monitor, n=7 PCBoard
Laptop, n=4, PCBoard
PlasmaTV, n=4, PCBoard
LCDTV, n=4, PCBoard
RemCont, n=6, PCBoard

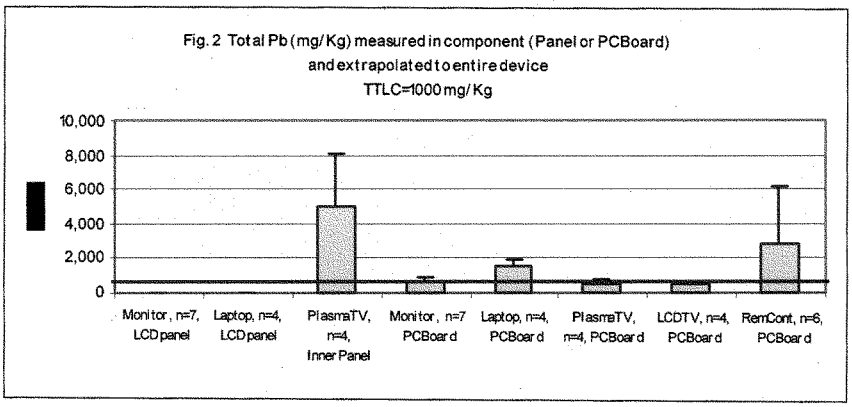
Fig. 2 Total Pb (mg/Kg) measured in component (Panel or PCBoard)
and extrapolated to entire device
TTLC=1000 mg/Kg
10,000
8,000
6,000
4,000
2,000
0
Monitor, n=7, LCD panel
Laptop, n=4, LCD panel
PlasmaTV, n=4, Inner Panel
Monitor, n=7 PCBoard
Laptop, n=4, PCBoard
PlasmaTV, n=4, PCBoard
LCDTV, n=4, PCBoard
RemCont, n=6, PCBoard

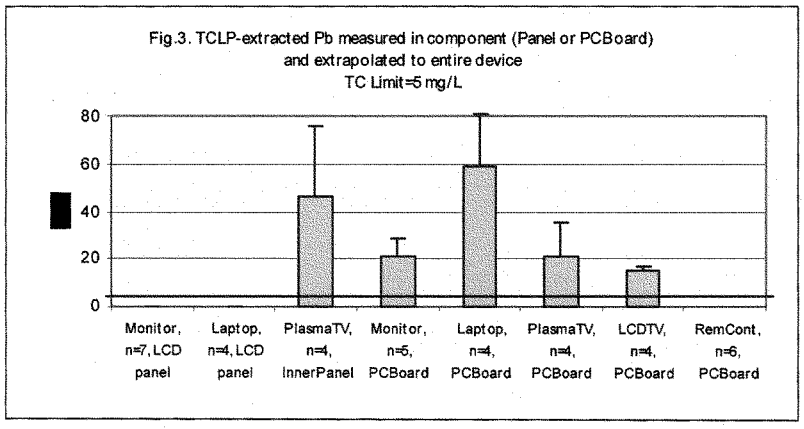
Fig.3. TCLP-extracted Pb measured in component (Panel or PCBoard)
and extrapolated to entire device
TC Limit=5 mg/L
80
60
40
20
0
Monitor, n=7, LCD panel
Laptop, n=4, LCD panel
PlasmaTV, n=4, InnerPanel
Monitor, n=5, PCBoard
Laptop, n=4, PCBoard
PlasmaTV, n=4, PCBoard
LCDTV, n=4, PCBoard
RemCont, n=6, PCBoard

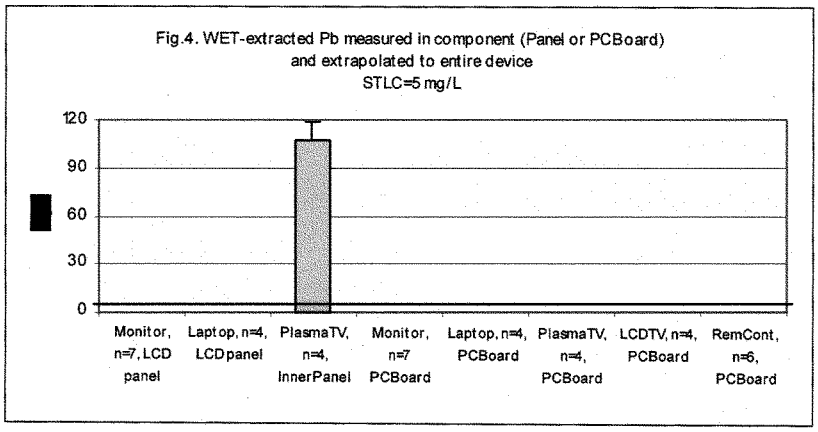
Fig.4. WET-extracted Pb measured in component (Panel or PCBoard)
and extrapolated to entire device
STLC=5 mg/L
120
90
60
30
0
Monitor, n=7, LCD panel
Laptop, n=4, LCD panel
PlasmaTV, n=4, InnerPanel
Monitor, n=7 PCBoard
Laptop, n=4, PCBoard
PlasmaTV, n=4, PCBoard
LCDTV, n=4, PCBoard
RemCont, n=6, PCBoard

Table 1 Devices tested and weights of components

Type	Brand	Model	Glass panel (outer) (g)	Plastic panel (inner) (g)	CCFL (g)	Rubber Coating (g)	PC Boards (g)	Battery/ Transformer/ Capacitors (g)	Plastic parts (g)	Metal PC boards/ Metals (g)	Remote Control plastic (g)	Remote Control PCboard (g)	Remote Control metal (g)	Total device (g)
LCD-1	NEC	Multi Sync LCD 1810 XtraView	800	NA	9.0	NA	598	0	1,379	2,378	NA	NA	NA	5,165
LCD-2	Mitsubishi	LXA565W	762	NA	3.4	NA	352	0	1,023	2,591	NA	NA	NA	4,731
LCD-3	Mitsubishi	LXA565W	778	NA	3.3	NA	346	0	1,010	2,660	NA	NA	NA	4,997
LCD-4	Sony	SDM-M81	1,770	NA	12.5	NA	66	0	1,682	3,362	NA	NA	NA	6,892
LCD-5	Sony	CPD-M151	935	NA	4.6	NA	290	0	1,286	2,440	NA	NA	NA	4,956
LCD-6	Sony	SOM-X52	746	NA	4.5	NA	236	0	994	2,504	NA	NA	NA	4,576
LCD-7	Sony	SOM-HJ53	691	NA	4.4	NA	243	0	804	1,848	NA	NA	NA	3,596
Laptop-1	Toshiba	Satellite Pro 400CDT	360	NA	1.6	NA	541	42	973	1,015	NA	NA	NA	2,933
Laptop-2	Toshiba	Satellite	347	NA	1.6	NA	503	599	885	721	NA	NA	NA	3,057
Laptop-3	Toshiba	Satellite T 2130CT	384	NA	1.0	NA	468	41	826	642	NA	NA	NA	2,362
Laptop-4	Compaq	Presario 1277	438	NA	NA	NA	296	412	353	1,548	NA	NA	NA	3,047
PlasmaTV1	Sony	PFM0C1	5,670	13,608	NA	412	2,279	551	1,710	15,514	NA	NA	NA	39,745
PlasmaTV2	Sony	PFM-50C1	NA	13,200	NA	799	2,991	1,764	570	16,292	NA	NA	NA	35,615
PlasmaTV3	Panasonic	TY-ST50PX20	5,897	12,457	NA	2,138	3,555	1,847	8,165	31,300	64.15	15.95	1.07	65,417
PlasmaTV4	Samsung	SPN4235	4,300	9,000	NA	1,137	2,492	1,785	2,636	17,090	105	34.50	NA	38,440
LCD TV1	JVC	LT-26WX84	899	707	169	NA	1,095	638	4,006	11,400	92.07	30.42	NA	18,914
LCD TV2	JVC	LT-26WX84	890	714	174	NA	1,157	591	3,994	11,400	92.3	25.10	NA	18,920
LCD TV3	Gateway	GTW-L30M103	1,124	906	251	NA	781	665	2,754	9,600	117.2	36.03	NA	15,938
LCD TV4	Sharp	LC37HV4U	1,819	1,361	177	NA	1,682	678	7,711	16,556	135.1	29	NA	29,985

Table 2.Total Concentrations in mg/kg of entire device. Values above regulatory limits appear in bold face.

						500	500	10,000	75	100	2,500	8,000	2,500	1,000	3,500	2,000	100	500	700	2,400	5,000
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn
LCD-1	MML0779-01	LCD Panel	800	5,165	0.15	ND	2.2	ND	ND	ND	10.7	ND	94	ND	ND	ND	ND	ND	ND	ND	ND
LCD-2	MML0779-07	LCD Panel	762	4,727	0.16	ND	ND	ND	ND	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-3	MML0779-13	LCD Panel	778	3,719	0.21	ND	ND	ND	ND	ND	7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-4	MML0779-19	LCD Panel	1,770	6,892	0.26	ND	3.9	ND	ND	ND	5.9	ND	ND	ND	10	ND	ND	ND	ND	ND	ND
LCD-5	MML0757-01	LCD Panel	935	4,958	0.19	ND	5.1	64	ND	ND	14.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-6	MML0757-03	LCD Panel	746	4,576	0.16	ND	2.6	0	ND	ND	3.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-7	MML0757-13	LCD Panel	691	3,596	0.19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
mean			926	4,805	0.19						8										
sd			380	1,096	0.04						4										
cv%			41	23	18.8						56										
UL			1,138	5,416	0.21						10										
Laptop-1T	AN00853	LCD Panel	360	2,571	0.14	NA	2	54	ND	ND	4	ND	5	ND	4	2	ND	ND	ND	ND	3
Laptop-2T	MML0779-43	LCD Panel	347	3,057	0.11	ND	7	83	ND	ND	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Laptop-3T	MML0779-55	LCD Panel	384	2,362	0.16	ND	4	60	ND	ND	10	ND	ND	ND	ND	ND	ND	3	ND	ND	ND
Laptop-4T	MML0779-67	LCD Panel	438	3,047	0.14	ND	ND	ND	ND	ND	3	ND	345	13	ND	ND	ND	20	ND	ND	ND
mean			382	2,759	0.14		5	66			7										
sd			40	349	0.02		3	15			4										
cv%			11	13	14.4		56	23			59										
UL			420	3,088	0.16		7	80			10										
LCD-1	MML0770-03	PCBoard	598	5,165	0.12	79	ND	394	ND	ND	8	ND	**13,894**	**1,065**	ND	162	ND	35	4	ND	ND
LCD-2	MML0779-09	PCBoard	352	4,727	0.07	39	ND	112	ND	ND	4	6	**13,404**	745	ND	89	ND	42	ND	ND	ND
LCD-3	MML0779-15	PCBoard	346	3,719	0.09	72	ND	428	ND	ND	20	ND	**15,816**	**1,023**	ND	307	ND	50	ND	ND	ND
LCD-4	MML0779-21	PCBoard	66	6,892	0.01	2	0.3	56	ND	ND	ND	ND	**3,447**	60	ND	34	ND	3	ND	ND	ND
LCD-5	MML0757-03	PCBoard	290	4,958	0.06	49	2	240	ND	ND	3	ND	**16,402**	404	ND	170	ND	29	ND	ND	ND
LCD-6	MML0757-09	PCBoard	236	4,576	0.05	35	ND	274	ND	ND	52	ND	**13,429**	723	ND	114	ND	18	ND	ND	ND
LCD-7	MML0757-15	PCBoard	243	3,596	0.07	135	2	257	ND	ND	ND	ND	**15,535**	648	ND	135	ND	41	ND	ND	ND
mean			305	4,805	0.07	59		251			17		**13,132**	667		145		31			
sd			161	1,096	0.03	42		135			20		**4,439**	349		85		16			
cv%			53	23	49.8	72		54			119		34	52		59		53			
UL			394	5,416	0.09	82		325			29		**15,548**	857		191		40			
Laptop-1B	MML0779-27	PCBoard	541	2,571	0.21	337	ND	505	ND	ND	12	ND	**44,189**	**1,515**	ND	1,326	ND	101	ND	ND	ND
Laptop-2B	MML0779-39	PCBoard	503	3,057	0.16	142	ND	872	ND	ND	9	ND	**36,199**	**1,333**	ND	790	ND	97	ND	ND	ND
Laptop-3B	MML0779-51	PCBoard	468	2,362	0.20	277	ND	674	ND	ND	9	ND	**57,460**	**2,180**	ND	1,030	ND	48	ND	ND	ND
Laptop-4B	MML0779-63	PCBoard	296	3,047	0.10	117	ND	544	ND	ND	30	ND	**16,515**	**1,069**	43	952	ND	20	ND	ND	ND
mean			452	2,759	0.17	218		649			15		**38,591**	**1,524**		1,024		67			
sd			108	349	0.05	106		165			10		**17,131**	474		224		39			
cv%			24	13	30.3	49		26			67		44	31		22		59			
UL			554	3,088	0.22	305		784			23		**52,621**	**1,912**		1,208		99			

Table 2.Total Concentrations in mg/kg of entire device. Values above regulatory limits appear in bold face.

Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn
						500	500	10,000	75	100	2,500	8,000	2,500	1,000	3,500	2,000	100	500	700	2,400	5,000
PlasmaTV1		Outer Panel	5,670	39,745	0.14	ND	ND	ND	ND	ND	ND	ND	257	ND	ND	ND	ND	ND	ND	ND	ND
PlasmaTV2		Outer Panel	NA	35,615	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PlasmaTV3		Outer Panel	5,897	65,353	0.09	ND	ND	ND	ND	ND	ND	ND	153	6	ND	ND	ND	ND	ND	ND	ND
PlasmaTV4		Outer Panel	4,300	38,439	0.11	ND	ND	ND	ND	ND	ND	ND	157	15	ND	ND	ND	ND	ND	ND	ND
mean													189								
sd													59								
cv%													31								
UL													253								
PlasmaTV1		Inner panel	13,608	39,745	0.34	ND	ND	51	ND	ND	48	19	55	**8,560**	ND	24	ND	72	ND	ND	33
PlasmaTV2		Inner panel	13,200	35,615	0.37	ND	ND	44	ND	ND	34	11	122	**7,783**	ND	16	ND	52	ND	ND	48
PlasmaTV3		Inner panel	12,457	65,353	0.19	ND	ND	ND	ND	ND	4	ND	**ND**	419	ND	ND	ND	27	ND	ND	ND
PlasmaTV4		Inner panel	9,000	38,439	0.23	ND	ND	16	ND	ND	19	ND	1	**3,044**	ND	9	ND	28	ND	ND	63
mean			12,066	44,788	0.28			37			26		59	**4,951**		16		45			48
sd			2,099	13,818	0.09			19			19		61	**3,882**		7		22			15
cv%			17	31	30.2			51			73		103	78		45		48			31
UL			14,046	57,818	0.37			58			42		126	**8,131**		24		62			60
PlasmaTV1		PCBoards	2,279	39,745	0.06	13	1.2	149	ND	ND	5	ND	**16,055**	631	ND	46	ND	17	ND	ND	ND
PlasmaTV2		PCBoards	2,991	35,615	0.08	19		529	ND	ND	5	ND	**22,675**	747	ND	445	ND	13	ND	ND	ND
PlasmaTV3		PCBoards	3,555	65,353	0.05	19		92	ND	ND	ND	ND	**11,423**	76	ND	87	ND	14	ND	ND	ND
PlasmaTV4		PCBoards	2,492	38,439	0.06	32	1.5	136	ND	ND	4	4	**14,911**	713	ND	ND	ND	ND	ND	ND	ND
mean			2,829	44,788	0.07	21		227					**16,266**	542							
sd			568	13,818	0.01	8		203					**4,705**	314							
cv%			20	31	20.4	39		90					29	58							
UL			3,365	57,818	0.08	28		393					**20,119**	799							
LCD TV1	MNC0812-01	Outer Panel	899	18,915	0.05	ND	1	16	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV2	MNC0812-11	Outer Panel	890	18,920	0.05	ND	1	16	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV3	MNC0812-21	Outer Panel	1,124	15,938	0.07	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV4	MCN0167-19	Outer Panel	1,819	29,715	0.06	4	ND	25	ND	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
mean			1,183	20,872	0.06						3										
sd			438	6,060	0.01						1										
cv%			37	29	20.1						39										
UL			1,596	26,587	0.07						4										
LCD TV1	MNC0812-02	Inner panel	703	18,915	0.04		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV2	MNC0812-12	Inner panel	714	18,920	0.04		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV3	MNC0812-22	Inner panel	906	15,938	0.06		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV4	MCN0167-20	Inner panel	1,361	29,715	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
mean			921	20,872	0.04																
sd			308	6,060	0.01																
cv%			33	29	20.7																
UL			1,211	26,587	0.05																

Table 2.Total Concentrations in mg/kg of entire device. Values above regulatory limits appear in bold face.

						500	500	10,000	75	100	2,500	8,000	2,500	1,000	3,500	2,000	100	500	700	2,400	5,000
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn
LCD TV1	MNC0812-04	PCBoards	1,095	18,915	0.06	41	1	272	ND	ND	4	ND	**9,841**	411	ND	45	ND	28	ND	ND	ND
LCD TV2	MNC0812-14	PCBoards	1,157	18,920	0.06	41	ND	330	ND	ND	7	ND	**11,009**	673	ND	153	ND	33	ND	ND	ND
LCD TV3	MNC0812-24	PCBoards	781	15,938	0.05	98	1	269	ND	ND	3	2	**9,797**	588	ND	294	ND	12	ND	ND	ND
LCD TV4	MCN0167-21	PCBoards	1,682	29,715	0.06	21	ND	249	ND	ND	2	ND	**8,491**	623	ND	68	ND	18	ND	ND	ND
mean			1,179	20,872	0.06	50		280			4		**9,785**	574		140		23			
sd			374	6,060	0.01	33		35			2		1,029	114		113		10			
cv%			32	29	9.2	66		12			56		11	20		81		43			
UL			1,531	26,587	0.06	81		309			6		**10,627**	667		232		30			
LCD TV1	MNC0812-10	RemotePCB	30	123	0.25	ND	ND	ND	ND	ND	ND	ND	**71,967**	ND	ND	ND	ND	13	ND	ND	ND
LCD TV2	MNC0812-20	RemotePCB	25	117	0.21	ND	ND	ND	ND	ND	ND	ND	**5,131**	ND	ND	ND	ND	38	ND	ND	ND
LCD TV3	MNC0812-30	RemotePCB	36	153	0.24	ND	ND	ND	ND	ND	ND	ND	**63,499**	800	ND	753	ND	14	ND	ND	ND
LCD TV4	MCN0167-25	RemotePCB	29	164	0.18	34	6	ND	ND	ND	15	ND	**9,355**	**1,306**	ND	300	ND	55	ND	ND	ND
PlasmaTV3	MNC0167-07	RemotePCB	16	81	0.196	45	ND	ND	ND	ND	ND	ND	**12,570**	255	ND	216	ND	110	ND	ND	ND
PlasmaTV4	MNC0167-16	RemotePCB	35	105	0.329	180	ND	2,800	ND	ND	60	200	**18,071**	**8,871**	ND	**6,900**	ND	340	ND	ND	ND
mean			243	3,904	0.21								**27,317**	**2,808**		2,042		86			
sd			568	10,002	0.08								**27,986**	**4,065**		**3,247**		117			
cv%			234	256	38.99								102	145		159		136			
UL			632	10,748	0.26								**44,181**	**6,137**		**4,702**		156			

Table 3.TCLP in mg/L of entire device. Values above regulatory limits appear in bold face.

						5	100	1	5	5	1	5
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	As	Ba	Cd	Cr	Pb	Se	Ag
LCD-1	MML0779-01	LCD Panel	800	5,165	0.155	ND	ND	ND	ND	ND	ND	ND
LCD-2	MML0779-07	LCD Panel	762	4,727	0.161	ND	ND	ND	ND	ND	ND	ND
LCD-3	MML0779-13	LCD Panel	778	4,797	0.162	ND	ND	ND	ND	ND	ND	ND
LCD-4	MML0779-19	LCD Panel	1,770	6,892	0.257	ND	ND	ND	ND	ND	ND	ND
LCD-5	MML0757-01	LCD Panel	935	4,958	0.188	ND	0.07	ND	0.002	ND	ND	ND
LCD-6	MML0757-03	LCD Panel	746	4,576	0.163	0.02	0.06	ND	ND	ND	ND	ND
LCD-7	MML0757-13	LCD Panel	691	3,596	0.192	0.02	ND	ND	ND	ND	ND	ND
mean			926	4,959	0.18							
sd			380	989	0.04							
cv%			41	20	19.56							
UL			1,132	5,497	0.20							
Laptop-1T	MML0779-25	LCD Panel	360	2,571	0.140	ND	ND	ND	ND	ND	ND	ND
Laptop-2T	MML0779-43	LCD Panel	347	3,057	0.114	ND	ND	ND	ND	ND	ND	ND
Laptop-3T	MML0779-55	LCD Panel	384	2,362	0.163	ND	ND	ND	ND	ND	ND	ND
Laptop-4T	MML0779-67	LCD Panel	438	3,047	0.144	ND	ND	ND	ND	1.72	ND	ND
mean			382	2,759	0.140							
sd			40	349	0.020							
cv%			11	13	14.4							
UL			415	3,045	0.16							
LCD-1	MML0770-03	PCBoard	598	5,165	0.116	ND	ND	ND	ND	0.16	ND	ND
LCD-2	MML0779-09	PCBoard	352	4,727	0.074	ND	ND	0.04	ND	**27.55**	ND	ND
LCD-3	MML0779-15	PCBoard	346	4,797	0.072	NA	NA	NA	NA	NA	NA	NA
LCD-4	MML0779-21	PCBoard	66	6,892	0.010	NA	NA	NA	NA	NA	NA	NA
LCD-5	MML0757-03	PCBoard	290	4,958	0.059	0.01	0.20	ND	0.004	**18.74**	ND	ND
LCD-6	MML0757-09	PCBoard	236	4,576	0.052	ND	0.19	ND	0.001	**30.47**	ND	ND
LCD-7	MML0757-15	PCBoard	243	3,596	0.068	ND	0.24	0.003	0.003	**26.34**	ND	ND
mean			305	4,959	0.06					**21**		
sd			161	989	0.03					**12**		
cv%			53	20	49.27					59		
UL			392	5,497	0.08					**29**		
Laptop-1B	MML0779-27	PCBoard	541	2,571	0.210	ND	ND	ND	ND	**76**	ND	ND
Laptop-2B	MML0779-39	PCBoard	503	3,057	0.165	ND	ND	0.03	ND	**58**	ND	ND
Laptop-3B	MML0779-51	PCBoard	468	2,362	0.198	ND	ND	0.03	ND	**81**	ND	ND
Laptop-4B	MML0779-63	PCBoard	296	3,047	0.097	ND	ND	ND	ND	**22**	ND	ND
mean			452	2,759	0.168					**59**		
sd			108	349	0.051					**27**		
cv%			24	13	30.3					45		
UL			541	3,045	0.21					**81**		
PlasmaTV1		Outer Panel	5,670	39,745	0.143	ND	ND	ND	ND	ND	ND	ND
PlasmaTV2		Outer Panel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PlasmaTV3		Outer Panel	5,897	65,353	0.090	ND	ND	ND	ND	0.05	ND	ND
PlasmaTV4		Outer Panel	4,300	38,439	0.112	ND	ND	ND	ND	0.07	ND	ND
mean			5,289	47,846	0.11							
sd			864	15,176	0.03							
cv%			16	32	23							
UL			6,230	60,275	0.14							

Table 3.TCLP in mg/L of entire device. Values above regulatory limits appear in bold face.

						5	**100**	**1**	**5**	**5**	**1**	**5**
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	As	Ba	Cd	Cr	Pb	Se	Ag
PlasmaTV1		Inner panel	13,608	39,745	0.342	ND	0.31	ND	ND	**29**	ND	ND
PlasmaTV2		Inner panel	13,200	35,615	0.371	ND	0.63	ND	ND	**27**	ND	ND
PlasmaTV3		Inner panel	12,457	65,353	0.191	ND	0.53	ND	ND	**101**	ND	ND
PlasmaTV4		Inner panel	9,000	38,439	0.234	ND	0.19	ND	ND	**28**	ND	ND
mean			12,066	44,788	0.28		0.4			**46**		
sd			2,099	13,818	0.09		0.2			**36**		
cv%			17	31	30		49			**78**		
UL			13,785	56,105	0.35		0.6			76		
PlasmaTV1		PCBoards	2,279	39,745	0.057	ND	0.21	ND	ND	**13**	ND	ND
PlasmaTV2		PCBoards	2,991	35,615	0.084	ND	0.34	ND	ND	**42**	ND	ND
PlasmaTV3		PCBoards	3,555	65,353	0.054	ND	0.21	ND	ND	1	ND	ND
PlasmaTV4		PCBoards	2,492	38,439	0.065	ND	0.23	ND	ND	**27**	ND	ND
mean			2,829	44,788	0.07		0.25			**21**		
sd			568	13,818	0.01		0.06			**18**		
cv%			20	31	20		24			84		
UL			3,295	56,105	0.08		0.30			**35**		
LCD TV1	MNC0812-01	Outer Panel	899	18,915	0.05	ND	0.02	ND	ND	ND	ND	ND
LCD TV2	MNC0812-11	Outer Panel	890	18,920	0.05	ND	0.02	ND	ND	ND	ND	ND
LCD TV3	MNC0812-21	Outer Panel	1,124	15,938	0.07	ND	0.00	ND	ND	ND	ND	ND
LCD TV4	MCN0167-19	Outer Panel	1,819	29,715	0.06	ND	0.04	ND	ND	0.01	ND	ND
mean			1,183	20,872	0.06							
sd			438	6,060	0.01							
cv%			37	29	20							
UL			1,541	25,835	0.07							
LCD TV1	MNC0812-02	Inner panel	703	18,915	0.04	ND	ND	ND	ND	ND	ND	ND
LCD TV2	MNC0812-12	Inner panel	714	18,920	0.04	ND	ND	ND	ND	ND	ND	ND
LCD TV3	MNC0812-22	Inner panel	906	15,938	0.06	ND	ND	ND	ND	ND	ND	ND
LCD TV4	MCN0167-20	Inner panel	1,361	29,715	0.05	ND	ND	ND	ND	ND	ND	ND
mean			921	20,872	0.04							
sd			308	6,060	0.01							
cv%			33	29	21							
UL			1,173	25,835	0.05							
LCD TV1	MNC0812-04	PCBoards	1,095	18,915	0.06	ND	0.20	ND	ND	**14**	ND	ND
LCD TV2	MNC0812-14	PCBoards	1,157	18,920	0.06	ND	0.23	ND	ND	**15**	ND	ND
LCD TV3	MNC0812-24	PCBoards	781	15,938	0.05	ND	0.16	ND	ND	**17**	ND	ND
LCD TV4	MCN0167-21	PCBoards	1,682	29,715	0.06	ND	0.16	ND	ND	**16**	ND	ND
mean			1,179	20,872	0.06		0.2			**15**		
sd			374	6,060	0.01		0.04			**1**		
cv%			32	29	9		18.7			9		
UL			1,485	25,835	0.06		0.2			**17**		

Table 4. WET-extractable elements in mg/L of entire device. Values above regulatory limits appear in bold face.

						15	**5**	**100**	**175**	**1**	**5**	**80**	**25**	**5**	**350**	**20**	**1**	**5**	**7**	**24**	**250**	**0.2**
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn	Hg
LCD-1	MML0779-01	LCD Panel	800	5,165	0.155	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-2	MML0779-07	LCD Panel	762	4,727	0.161	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-3	MML0779-13	LCD Panel	778	4,797	0.162	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-4	MML0779-19	LCD Panel	1,770	6,892	0.257	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-5	MML0757-01	LCD Panel	935	4,958	0.188	ND	ND	0.21	ND	ND	0.01	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD-6	MML0757-03	LCD Panel	746	4,576	0.163	ND	ND	0.18	ND	ND	0.004	ND	0.07	ND	ND	ND	ND	ND	ND	ND	0.02	ND
LCD-7	MML0757-13	LCD Panel	691	3,596	0.192	ND	ND	ND	ND	ND	ND	ND	0.08	ND	ND	0.02	ND	ND	ND	ND	0.02	ND
mean			926	4,959	0.18																	
sd			380	989	0.04																	
cv%			41	20	19.56																	
UL			1,132	5,497	0.20																	
Laptop-1T	MML0779-25	LCD Panel	360	2,571	0.140	ND	ND	0.50	ND	ND	0.11	ND	0.18	ND	0.15	ND	ND	ND	ND	ND	0.13	ND
Laptop-2T	MML0779-43	LCD Panel	347	3,057	0.114	ND	ND	ND	ND	ND	ND	ND	0.14	ND	ND	ND	ND	ND	ND	ND	ND	ND
Laptop-3T	MML0779-55	LCD Panel	384	2,362	0.163	ND	ND	ND	ND	ND	ND	ND	0.20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Laptop-4T	MML0779-67	LCD Panel	438	3,047	0.144	0.03	ND	ND	ND	ND	ND	ND	0.78	6.04	ND	ND	ND	ND	ND	ND	ND	ND
mean			382	2,759	0.140								0.322									
sd			40	349	0.020								0.304									
cv%			11	13	14.4								94.2									
UL			415	3,045	0.157								0.57									
LCD-1	MML0770-03	PCBoard	598	5,165	0.116	1.03	ND	2.08	ND	ND	ND	ND	ND	0.28	ND	ND	ND	ND	0.06	ND	1.62	ND
LCD-2	MML0779-09	PCBoard	352	4,727	0.074	0.73	ND	1.19	ND	0.07	ND	ND	ND	0.28	ND	0.97	ND	ND	ND	ND	21.6	ND
LCD-3	MML0779-15	PCBoard	346	4,797	0.072	0.69	ND	0.72	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.08	ND
LCD-4	MML0779-21	PCBoard	66	6,892	0.010	0.08	ND	0.20	ND	ND	ND	ND	ND	0.96	ND	ND	ND	ND	ND	ND	0.16	ND
LCD-5	MML0757-03	PCBoard	290	4,958	0.059	ND	ND	1.23	ND	ND	0.01	ND	ND	1.23	ND	0.12	ND	ND	ND	ND	0.47	ND
LCD-6	MML0757-09	PCBoard	236	4,576	0.052	ND	ND	1.19	ND	ND	0.01	0.01	0.004	0.11	ND	0.07	ND	ND	ND	ND	0.51	ND
LCD-7	MML0757-15	PCBoard	243	3,596	0.068	ND	ND	0.95	ND	0.01	0.01	0.05	0.01	0.23	ND	0.44	ND	ND	ND	ND	2.43	ND
mean			305	4,959	0.06	0.633		1.1						0.5		0.401					4	
sd			161	989	0.03	0.398		0.6						0.5		0.412					8	
cv%			53	20	49.27	62.9		53.1						90		102.8					196	
UL			392	5,497	0.081	0.96		1.39						0.76		0.74					8.23	

Table 4. WET-extractable elements in mg/L of entire device. Values above regulatory limits appear in bold face.

						15	5	100	175	1	5	80	25	5	350	20	1	5	7	24	250	0.2
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn	Hg
Laptop-1B	MML0779-27	PCBoard	541	2,571	0.210	2.95	ND	3.37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.01	ND
Laptop-2B	MML0779-39	PCBoard	503	3,057	0.165	1.81	ND	2.14	ND	22.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.97	ND
Laptop-3B	MML0779-51	PCBoard	468	2,362	0.198	2.77	ND	2.38	ND	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.96	ND
Laptop-4B	MML0779-63	PCBoard	296	3,047	0.097	0.60	ND	2.14	ND	ND	ND	ND	ND	0.30	ND	ND	ND	ND	ND	ND	12.63	ND
mean			452	2,759	0.168	2		3													5	
sd			108	349	0.051	1		1													6	
cv%			24	13	30.3	53		23													119	
UL			541	3,045	0.21	3		3													9	
PlasmaTV1		Outer Panel	5,670	39,745	0.143	ND	ND	ND	ND	ND	ND	ND	1.85	ND	ND	ND	ND	ND	ND	ND	0.74	ND
PlasmaTV2		Outer Panel	NA	35,615	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PlasmaTV3		Outer Panel	5,897	65,353	0.090	ND	ND	ND	ND	ND	ND	ND	1.08	ND	ND	ND	ND	ND	ND	ND	ND	ND
PlasmaTV4		Outer Panel	4,300	38,439	0.112	ND	ND	ND	ND	ND	ND	ND	1.68	0.16	ND	ND	ND	ND	ND	ND	0.02	0.56
mean			5,289	44,788	0.115								1.54									
sd			864	13,818	0.026								0.40									
cv%			16	31	22.9								26.3									
UL			6,232	59,866	0.14								1.98									
PlasmaTV1		Inner panel	13,608	39,745	0.342	ND	ND	1.6	ND	ND	ND	ND	0.24	**96**	ND	ND	ND	ND	ND	ND	0.45	ND
PlasmaTV2		Inner panel	13,200	35,615	0.371	ND	ND	2.6	ND	ND	ND	ND	0.15	**93**	ND	ND	ND	ND	ND	ND	0.59	ND
PlasmaTV3		Inner panel	12,457	65,353	0.191	ND	ND	3.0	ND	ND	ND	ND	0.07	**116**	ND	0.05	ND	ND	ND	ND	3.62	ND
PlasmaTV4		Inner panel	9,000	38,439	0.234	ND	ND	1.0	ND	ND	ND	ND	0.03	**122**	ND	0.07	ND	ND	ND	ND	3.75	ND
mean			12,066	44,788	0.284			2.1					0.123	**107**							2.101	
sd			2,099	13,818	0.086			0.9					0.092	**15**							1.829	
cv%			17	31	30.2			44					75.0	14							87.0	
UL			13,785	56,105	0.35			3					0.20	**119**							3.60	
PlasmaTV1		PCBoards	2,279	39,745	0.057	0.23	ND	1.43	ND	ND	ND	ND	0.003	0.09	ND	ND	ND	ND	ND	ND	ND	ND
PlasmaTV2		PCBoards	2,991	35,615	0.084	0.36	ND	1.85	ND	ND	ND	ND	0.003	0.08	ND	ND	ND	ND	ND	ND	1.34	ND
PlasmaTV3		PCBoards	3,555	65,353	0.054	0.50	ND	1.41	ND	ND	ND	ND	0.004	0.04	ND	0.05	ND	ND	ND	ND	1.58	0.28
PlasmaTV4		PCBoards	2,492	38,439	0.065	0.26	ND	1.43	ND	ND	ND	ND	0.003	0.15	ND	0.08	ND	ND	ND	ND	6.03	ND
mean			2,829	44,788	0.065	0.34		1.53					0.003	0.1							2.983	
sd			568	13,818	0.013	0.12		0.21					0.001	0.05							2.640	
cv%			20	31	20.4	36		13.8					24.5	51.7							88.5	
UL			3,295	56,105	0.08	0.44		1.70					0.004	0.1							5.15	

Table 4. WET-extractable elements in mg/L of entire device. Values above regulatory limits appear in bold face.

						15	5	100	175	1	5	80	25	5	350	20	1	5	7	24	250	0.2
Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn	Hg
LCD TV1	MNC0812-01	Outer Panel	899	18,915	0.048	ND	ND	0.14	ND	ND	ND	ND	0.024	0.01	ND	ND	ND	ND	ND	ND	0.03	ND
LCD TV2	MNC0812-11	Outer Panel	890	18,920	0.047	ND	ND	0.13	ND	ND	ND	ND	0.014	ND	ND	ND	ND	ND	ND	ND	0.02	ND
LCD TV3	MNC0812-21	Outer Panel	1,124	15,938	0.071	ND	ND	ND	ND	ND	ND	ND	0.085	0.01	ND	ND	ND	ND	ND	ND	0.01	ND
LCD TV4	MCN0167-19	Outer Panel	1,819	29,715	0.061	0.03	ND	0.18	ND	ND	ND	ND	0.001	0.02	ND	ND	ND	ND	ND	ND	ND	ND
mean			1,183	20,872	0.057			0.2					0.03	0.01							0.019	
sd			438	6,060	0.011			0.0					0.04	0.004							0.010	
cv%			37	29	20.1			15.9					120	31.6							51.4	
UL			1,541	25,835	0.07			0.18					0.1	0.02							0.03	
LCD TV1	MNC0812-02	Inner panel	703	18,915	0.04	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV2	MNC0812-12	Inner panel	714	18,920	0.04	ND	ND	ND	ND	ND	ND	ND	0.03	0.01	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV3	MNC0812-22	Inner panel	906	15,938	0.06	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD TV4	MCN0167-20	Inner panel	1,361	29,715	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
mean			921	20,872	0.044								0.02									
sd			308	6,060	0.009								0.01									
cv%			33	29	20.7								77									
UL			1,173	25,835	0.05								0.03									
LCD TV1	MNC0812-04	PCBoards	1,095	18,915	0.06	1.04	ND	1.56	ND	ND	0.01	ND	0.004	0.08	ND	ND	ND	ND	ND	ND	3.07	ND
LCD TV2	MNC0812-14	PCBoards	1,157	18,920	0.06	1.04	ND	1.77	ND	ND	0.02	0.03	0.01	0.08	ND	0.09	ND	ND	ND	ND	6.12	ND
LCD TV3	MNC0812-24	PCBoards	781	15,938	0.05	1.13	ND	1.18	ND	ND	0.01	0.00	0.01	0.08	ND	0.07	ND	ND	ND	ND	3.58	ND
LCD TV4	MCN0167-21	PCBoards	1,682	29,715	0.06	0.34	ND	1.25	ND	ND	0.01	0.07	0.01	0.04	ND	0.10	ND	ND	ND	ND	4.64	ND
mean			1,179	20,872	0.056	0.9		1.4			0.01	0.04	0.01	0.1		0.09					4.4	
sd			374	6,060	0.005	0.4		0.3			0.005	0.03	0.001	0.020		0.01					1.3	
cv%			32	29	9.2	41.4		19.4			45.1	90	20.4	28.3		14					31.0	
UL			1,485	25,835	0.06	1.2		1.7			0.01	0.06	0.01	0.1		0.10					5.5	

Table 5 **Concentrations of Hg (mg/kg) in CCFL and in entire device. Values above regulatory limits appear in bold face.**

TTLC			20								
CCFL	ID	CCFL WT (g)	Hg in CCFL (mg/Kg)	Dupl 1	Dupl 2	Mean	SD	%CV	DEVICE WT (g)	Factor= Part/Device	Hg in DEVICE (mg/Kg)
LCD1	MML0779-02	8.99	**110**	**984**	**878**	**657**	**477**	72.6	5,165	0.00174	1.14
LCD2	AN00852	3.4	**337**			**337**			4,727	0.00072	0.24
LCD3	MML0779-14	3.33	**520**	**745**	**306**	**524**	**220**	41.9	4,797	0.00069	0.36
LCD4	MML0779-20	12.50	**32**	**72**	**38.2**	**47**	**22**	45.4	6,892	0.00181	0.09
LCD5	MML0757-02	4.57	**43**	**59.4**	**147**	**83**	**56**	67.3	4,958	0.00092	0.08
LCD6	MML0757-08	4.54	**48**	**20.8**	**40.3**	**36**	14	38.6	4,576	0.00099	0.04
LCD7	MML0757-14	4.40	**230**	**63**	**132**	**142**	**84**	59.2	3,596	0.00122	0.17
LAPTOP1	AN00853	1.59	**220**			**220**			2,933	0.00054	0.12
LAPTOP2	MML0779-44	1.62	**300**	**349**	**329**	**326**	**25**	7.6	3,057	0.00053	0.17
LAPTOP3	MML0779-56	0.99	**440**	**438**		**439**			2,362	0.00042	0.18
LAPTOP4	NA	NA	NA						NA	NA	NA
PlasmaTV1	NA	NA	NA						NA	NA	NA
PlasmaTV2	NA	NA	NA						NA	NA	NA
PlasmaTV3	NA	NA	NA						NA	NA	NA
PlasmaTV4	NA	NA	NA						NA	NA	NA
LCD TV1	MNC0812-03	169	**660**	**313**	**321**	**431**	**198**	45.9	18,915	0.00893	3.85
LCD TV2	MNC0812-13	173	**250**	**118**	**251**	**206**	**77**	37.1	18,920	0.00914	1.89
LCD TV3	MNC0812-23	251	**190**	**156**	**98.5**	**148**	**46**	31.2	15,938	0.01573	2.33
LCD TV4	MCN0167-18	177	**440**	**444**	**735**	**540**	**169**	31.3	29,715	0.00597	3.22
Average						**296**	**126**	43.5			

Table 6. Duplicate analysis for Total metals in selected components

Collector's Number		Type of Sample	Wt of part	Wt of Device	Factor= Part/Device	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Ti	V	Zn
						500	500	10,000	75	100	2,500	8,000	2,500	1,000	3,500	2,000	100	500	700	2,400	5,000
PlasmaTV1		Outer Glass	5,670	39,745	0.143						11		257								
PlasmaTV1 RE		Outer Glass	5,670	39,745	0.143						14		171								
mean											12		214								
RPD											23.5		40.0								
PlasmaTV3		Outer Glass	5,897	65,353	0.090						16		153	5.5				42			
PlasmaTV3RE1		Outer Glass	5,897	65,353	0.090						12		144	4.9							
PlasmaTV3RE2		Outer Glass	5,897	65,353	0.090						11		226	2.3							
mean											13		174	4.2							
sd											3		45	1.7							
cv%											22.4		25.5	40.9							

TABLE 7. Summary Table. Values above regulatory limits appear in bold face.

Test	Element	Regulatory Limit		Device	Component	n	mean	sd	UL	Req N	Conclusions
TTLC	Cu	2,500	mg/kg								
				LCDMonitor	LCD panel	7	ND				
				Laptop	LCD panel	4	ND				
				PlasmaTV	Inner panel	4	59	61	126	0.1	
				LCDMonitor	PCBoard	7	**13,132**	**4,439**	**15,548**	0.5	Exceeds TTLC=2,500 mg/kg
				Laptop	PCBoard	4	**38,591**	**17,131**	**52,621**	0.6	Exceeds TTLC=2,500 mg/kg
				PlasmaTV	PCBoard	4	**16,266**	**4,705**	**20,119**	0.3	Exceeds TTLC=2,500 mg/kg
				LCDTV	PCBoard	4	**9,785**	1,029	**10,627**	0.1	Exceeds TTLC=2,500 mg/kg
				RemCont	PCBoard	6	**27,317**	**27,986**	**44,181**	3.4	Exceeds TTLC=2,500 mg/kg
TTLC	Pb	1,000	mg/kg								
				LCDMonitor	LCD panel	7	ND				
				Laptop	LCD panel	4	ND				
				PlasmaTV	Inner panel	4	**4,951**	**3,882**	**8,131**	2.6	Exceeds TTLC=1,000 mg/kg
				LCDMonitor	PCBoard	7	667	349	857	2.9	
				Laptop	PCBoard	4	**1,524**	474	**1,912**	2.2	Exceeds TTLC=1,000 mg/kg
				PlasmaTV	PCBoard	4	542	314	799	1.3	
				LCDTV	PCBoard	4	574	114	667	0.2	
				RemCont	PCBoard	6	**2,808**	**4,065**	**6,137**	**11.0**	Additional samples needed
TCLP	Pb	5	mg/L								
				LCDMonitor	LCD panel	7	ND				
				Laptop	LCD panel	4	ND				
				PlasmaTV	Inner panel	4	**46**	**36**	**76**	2.1	Exceeds TCLimit=5 mg/L
				LCDMonitor	PCBoard	5	**21**	**12**	**29**	1.4	Exceeds TCLimit=5 mg/L
				Laptop	PCBoard	4	**59**	**27**	**81**	0.6	Exceeds TCLimit=5 mg/L
				PlasmaTV	PCBoard	4	**21**	**18**	**35**	3.4	Exceeds TCLimit=5 mg/L
				LCDTV	PCBoard	4	**15**	1	**17**	0.1	Exceeds TCLimit=5 mg/L
WET	Pb	5	mg/L								
				LCDMonitor	LCD panel	7	ND				
				Laptop	LCD panel	4	ND				
				PlasmaTV	Inner panel	4	**107**	**15**	**119**	0.1	Exceeds STLC=5 mg/L
				LCDMonitor	PCBoard	7	0.5	0.5			
				Laptop	PCBoard	4	0.3	0.3			
				PlasmaTV	PCBoard	4	0.1	0.05			
				LCDTV	PCBoard	4	0.1	0.02			

California Environmental Protection Agency
Department of Toxic Substances Control
Hazardous Materials Laboratory

Appendix A 1

Procedural SOP No. 916-S

Preparation of consumer electronic devices containing Liquid Crystal Displays (LCDs) for Metals, California Waste Extraction Test and Toxicity Characteristic Leaching Procedure

1 Scope and Application

1.1 This procedure is applicable to the preparation of samples of consumer electronic devices containing liquid crystal displays (LCDs) to determine the total metal content, California Waste extraction test (WET) and Toxicity Characteristic Leaching Procedure (TCLP) extractable metals in various components. For Hg testing in cold cathode fluorescent lamps (CCFLs) use HML, SOP No. 914-S.

1.2 This SOP describes the procedure to disassemble waste products, segregate components, and prepare samples prior to extraction or digestion procedures for subsequent analyses.

1.3 This procedure is recommended for use by laboratory assistants and/or technicians working under the close supervision of chemists experienced in the sample preparation requirements for inorganic analyses, and by chemists working independently.

2 Summary

2.1 Two product types of consumer electronic devices are identified: laptop computers and liquid crystal display (LCD) monitors.

2.2 The total weight of each device (sample) is recorded on Form 1. The samples are then photographed, disassembled and segregated into six major component fractions for subsequent preparation and possible analysis. These fractions are:

- 2.2.1 LCD panel
- 2.2.2 Cold Cathode Fluorescent Lamp (CCFL)
- 2.2.3 Printed circuit board
- 2.2.4 Plastics
- 2.2.5 Metal fractions
- 2.2.6 Batteries

Appendix A 1

Procedural SOP No. 916-S

Preparation of consumer electronic devices containing Liquid Crystal Displays (LCDs) for Metals, California Waste Extraction Test and Toxicity Characteristic Leaching Procedure

1 Scope and Application

1.1 This procedure is applicable to the preparation of samples of consumer electronic devices containing liquid crystal displays (LCDs) to determine the total metal content, California Waste extraction test (WET) and Toxicity Characteristic Leaching Procedure (TCLP) extractable metals in various components. For Hg testing in cold cathode fluorescent lamps (CCFLs) use HML, SOP No. 914-S.

1.2 This SOP describes the procedure to disassemble waste products, segregate components, and prepare samples prior to extraction or digestion procedures for subsequent analyses.

1.3 This procedure is recommended for use by laboratory assistants and/or technicians working under the close supervision of chemists experienced in the sample preparation requirements for inorganic analyses, and by chemists working independently.

2 Summary

2.1 Two product types of consumer electronic devices are identified: laptop computers and liquid crystal display (LCD) monitors.

2.2 The total weight of each device (sample) is recorded on Form 1. The samples are then photographed, disassembled and segregated into six major component fractions for subsequent preparation and possible analysis. These fractions are:

- 2.2.1 LCD panel
- 2.2.2 Cold Cathode Fluorescent Lamp (CCFL)
- 2.2.3 Printed circuit board
- 2.2.4 Plastics
- 2.2.5 Metal fractions
- 2.2.6 Batteries

Each component fraction is photographed, weighed and stored in separate labeled containers.

2.3 The required component fraction of a sample is shredded, milled to pass through a No.18 (1 mm) sieve, mixed for homogeneity, and then representatively sub-sampled to obtain aliquots for analysis.
Note: A No.10 (2 mm) sieve may be used for total, WET and TCLP if a No.18 (1 mm) is not available.

2.4 Particle size reduction is achieved by grinding to the required mesh size. An appropriate shredder and mill or grinder is used for this process (Retsch, Model #SM-2000, or equivalent).

2.5 Interferences from carryover from one sample to another must be minimized by thoroughly cleaning the equipment as needed. All containers must be clean and free of organic and inorganic substances. Small milling or grinding units may be cleaned as described in HML SOP 704-S.

3 Safety

3.1 Sample preparation should be performed in a well ventilated room.

3.2 Nitrile gloves may be worn for hand protection, but they must not come in contact with the sample, or the interior of the sample containers, to avoid any organic and inorganic contamination.

3.3 Use safety glasses or goggles when shredding, milling or grinding the samples.

3.4 The operator may wear a dust mask and coveralls if necessary during the process.

3.5 The work area (counters, balances, mills, equipment, tools) should be kept clean at all times.

3.6 Operating instructions must be followed while using the shredder and/or the grinder.

4 Apparatus and Materials

4.1 Hand tools: screwdrivers, electric drill/saw, cutters and pliers, etc.

4.2 Rotary mill or an automatic grinder capable of grinding hard plastics and printed circuit boards.

4.3 Sieve No. 18 (1 mm).

4.4 Electric cutter or a shredding machine capable of reducing particle size of the material into small pieces.

4.5 Top loading balance 20 Kg capacity (accurate to +/-1.0 g).

4.6 Top loading balance 1 Kg capacity (accurate to +/- 0.2 g).

4.7 Dust masks, face shields or eye goggles.

4.8 Nitrile gloves.

4.9 Teflon or glass containers of appropriate size for storing the prepared samples.

4.10 Liquid nitrogen

4.11 De-ionized water

4.12 Nitric acid, 5 percent

4.13 Acetone

5 Disassembly/Separation Procedure

5.1 Remove all external electrical cords and computer cables.

5.2 Label each sample, photograph, weigh and record weight using Form 1.

5.3 Unhinge and separate computer laptop samples into two samples, the LCD panel (i.e. the top part) and the Computer Processing Unit (i.e. the bottom part). Note: This may require disassembly and reassembly of the top portion of the laptop. Keep all component fractions of top and bottom parts separately. Assign suffix "B" for bottom and "T" for top parts to the ID number assigned to the device. From this point forward the top part (the LCD panel) will be analyzed as an LCD device sample.

5.4 Dismantle each sample and separate into its major component fractions, namely:
- 5.4.1 LCD panel
- 5.4.2 Cold Cathode Fluorescent Lamp (CCFL)
- 5.4.3 Printed circuit board
- 5.4.4 Plastics
- 5.4.5 Metal fractions
- 5.4.6 Batteries

5.5 Remove extraneous material, like nuts, screws, loose wires, and metal brackets and include with the metal component fraction.

5.6 Cold Cathode Fluorescent Lamp (CCFL) component fractions are photographed, weighed and prepared in accordance with SOP 914-S and analyzed.

5.7 Printed circuit board fractions are photographed, weighed and stored in properly identified containers.

5.8 Plastic components are photographed, weighed and stored in properly identified containers.

5.9 Metal components (including metal brackets, screws and wires) are photographed, weighed and stored in properly identified containers.

5.10 Batteries are weighed and stored separately.

6 Size Reduction Procedure

6.1 The entire sample component fraction slated for analysis (i.e., LCDs or circuit boards) is size-reduced by cutting/shredding and milling.

6.2 The milling equipment is fitted with a 1 mm sieve (2 mm sieve may be substituted) and the entire sample component fraction is processed.

6.3 Clean the shredder (wear mask and/or goggles) after processing each component fraction. Inspect to ensure the shredder is completely free of particles.

6.4 Process at least 10g of plastic chips, or other equipment blank material, for analysis to check for cross-contamination.

6.5 Collect the sieved sample, record weight on Form 1 and store in a properly labeled container.

6.6 Appropriate aliquots of the milled material are taken for metals, TCLP and WET determinations.

7 Quality Control

7.1 Although most of the QC requirements are defined in the respective analytical procedures, at a minimum, the following quality checks are required.

7.2 A sample batch is defined as a group of 10 samples [excluding LCS (laboratory control sample), MS (matrix spike) and MSD (matrix spike duplicate)] or less, that is processed together and that is comprised of similar component fractions (i.e. circuit board fractions or LCD Panel fractions).

7.3 A sample batch must consist of samples of the same matrix processed and digested/extracted and analyzed at the same time. Any other type of matrix QC included with the samples is not acceptable.

7.4 Each batch shall contain one method blank. The blank shall contain all reagents processed with that batch.

7.5 Each batch must include a replicate (sample duplicate).

7.6 Each batch shall contain an MS and an MSD.

7.7 Each batch shall contain a method standard or LCS containing all elements/compounds of concern.

7.8 Either the LCS or the MS/MSD (or both) must be prepared from secondary source standards. (i.e., the source must differ from the calibration standards by lot # at a minimum.)

8 References

8.1 California Code of Regulations, Title 22, Section 66261.20

8.2 HML, SOP 914-S

8.3 HML, SOP 704-S

8.4 Toxicity Characteristic Leaching Procedure, Federal Register, Method 1311, SW-846.

8.5 Test Methods for Evaluating Wastes: Physical/Chemical methods, US Environmental Protection Agency, Office of Solis Waste, Washington, DC, SW-846, Vol.1A, 3rd Edition, Update III.

9 Acknowledgement

This procedure was developed by the Hazardous Materials Laboratory, and the Waste Identification and Recycling Unit of the Department of Toxic Substances Control. For more information please contact Jarnail Garcha at (510) 540-3468.

Form 1. Weights of entire device and components in grams

HML or LAB ID#	Collector's ID#	Device (before disassembly)	Glass Panel	CCFL	PC Boards	Plastics	Metals	Batteries	Sum of Components	NOTES

California Environmental Protection Agency
Department of Toxic Substances Control
Hazardous Materials Laboratory

Appendix A 2

Procedural SOP No. 914-S

Preparation of Cold Cathode Fluorescent Lamps for Mercury Testing, including WET and TCLP

1. Scope and Application

This SOP is applicable to the preparation of cold cathode fluorescent lamps (CCFL) for mercury analysis using EPA Method 7470A, 7471A, EPA Method 1311 for TCLP, and HML Method 910-M for WET. CCFLs are commonly used in liquid crystal display (LCD) electronic devices.

2. Safety

2.1. Protective nitrile gloves and a face shield should always be worn while crushing the samples.

2.2. Crushing of the samples should always be carried out in the hood.

2.3. Samples should be wrapped in double heavy duty tear resistant plastic bags before crushing.

3. Materials and Equipment

3.1. Heavy duty hydraulic press, 40000 lb RAM force, 4" RAM (Pasadena Hydraulics, Inc.), or equivalent.

3.2. Polypropylene tear resistant plastic bags that can withstand 165 g dart test per ASTM D1709-85 (1.5 X 2 ft).

3.3. Rubber Mallet or hammer.

3.4. Sieves – No.18 mesh (1 mm opening) and No. 10 (2 mm opening).

3.5. Glass containers.

3.6. Freezer (-12 ^{0}C).

3.7. Scissors or Wire cutter.

3.8. Mortar and Pestle.

4. Procedure:

4.1. For Total Mercury , TCLP and WET Determinations

4.1.1. Cut the end cap wiring attached to the lamp with the scissors or a wire cutter. Record the weight and store separately or save the wiring with the metal fraction of the device, if appropriate, as described in HML SOP 916-S. Store samples at minus 12^0 C.

4.1.2. Weigh and record the weight of each lamp (or all lamps for a composite sample, if TCLP and or WET analysis is required) along with the end caps.

4.1.3. Place the lamp with the end caps intact into a double heavy duty polypropylene plastic bag. For longer lamps use extra long bags. Leave the sample containing bag in a freezer for one hour.

Note: Do not remove the end caps or break the sample before freezing.

4.1.4. Take the frozen sample (in the plastic bag) out of the freezer and break the lamp initially with a rubber mallet or a hammer into small pieces, then crush the lamp under the hydraulic press (if necessary).

4.1.5. Transfer the crushed samples from the plastic bag into a mortar and grind with the pestle until all the materials pass through the 1mm sieve for total Hg analysis, and use the 2mm sieve for WET & TCLP. Weigh and set aside the visible small end cap copper wire pieces.

4.1.6 Weigh and transfer the sieved sample into a glass container and store at -12^0 C.

4.1.7. Take an aliquot of 0.2 to 1.0 gram of the above prepared sample for total Hg analysis by EPA Method 7471A (or use the entire sample if necessary, to meet the detection limit criteria for this analysis). Test sub-samples in triplicate.

4.1.8. If enough sample material is available, take an aliquot of the sample from step 4.1.6 of the above procedure for WET and TCLP analysis.

4.1.9. Five to ten grams of sample may be used for WET and /or TCLP, based on sample availability. Add a proportionate amount of extracting fluids to the sample and perform WET and/or TCLP extractions as outlined in HML Method 910-S and EPA Method 1311, respectively, and determine Hg concentrations by EPA Method 7470A.

Important Note: For WET and TCLP, use extraction vessels that can accommodate the sample and the extraction fluid with as little head space as possible to avoid any loss of Hg due to dissipation or evaporation. Digest the extracts right after the extraction. Mercury may dissipate or evaporate in the head space if the extracts are stored for an extended period of time.

5. References

5.1. California Code of Regulations, Title 22, Vol. 29, Article 11, Sections 66699, 66700.

5.2. Toxicity Characteristic Leaching Procedure, Federal Register, Method 1311, SW-846.

5.3. Test Methods for Evaluating Wastes: Physical/Chemical Methods, US Environmental Protection Agency, Office of Solid Waste Washington, DC, SW846, Vol. 1A, 3rd Edition, Update III.

6. Acknowledgement

This procedure was developed by the Inorganic Section of the Hazardous Materials Laboratory, Department of Toxic Substances. For more information please contact Jarnail Garcha at (510) 540-3468.

Appendix B. Table QC-I: Quality Control for Total Concentrations

Collector's ID		Sb	Ar	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Th	V	Zn
LCD-1	Blank A13030-BLK9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD Panel	LCS (50 mg/Kg)	49.5	46.4	48.4	43.0	48.8	50.2	49.9	52.7	49.6	46.4	50.5	45.1	49.9	48.0	49.7	49.5
MMLO779-01	% RECOVERY	99	92.8	96.8	86	97.6	100	99.8	105	99.2	92.8	101	90.2	99.8	96.0	99.4	99
Spike level	Source Result	9.60	14.0	89.0	ND	ND	69	0.68	610	ND	2.00	32	ND	ND	ND	ND	17.0
50 mg/Kg	Matrix Spike 1	63.4	75.3	224	43.9	47.9	120	50.7	266	61.8	48.1	83.3	49.7	47.7	45.0	50.4	82.4
	Matrix Spike 2	61.6	67.9	183	43.6	46.7	124	49.7	142	50.7	48.8	82.5	47.4	47.4	44.7	49.9	71.6
	% REC. 1	108	123	270	87.8	95.8	102	100	NR	124	92.2	103	99.4	95.4	90.0	101	131
	% REC. 2	104	108	188	87.2	93.4	110	98	NR	101	93.6	101	94.8	94.8	89.4	99.8	109
	RPD	2.88	10.3	20.1	0.686	2.54	3.28	1.99	60.8	19.7	1.44	0.965	4.74	0.631	0.669	0.997	14
LCD-2	Blank 4A14014-BLK3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD Panel	LCS (50 mg/Kg)	48.9	48.2	48.6	44.1	48.1	50.4	50.8	48.5	50	48.3	50.4	47.4	49.6	49.3	50.4	49.4
MMLO779-7	% RECOVERY	97.8	96.4	97.2	88.2	97.4	101	102	97	100	96.6	101	94.8	99.2	98.6	101	98.8
Spike level	Source Result	5.2	ND	190	ND	ND	24	ND	26	ND	1.3	10	ND	ND	ND	ND	ND
50 mg/Kg	Matrix Spike 1	43.8	47.7	244	44.5	47.3	76.6	50.9	67.4	49.7	48.4	60.6	48.8	48.6	45.3	50.6	53.1
	Matrix Spike 2	43.7	48	341	42.6	47	76.8	50.3	82.3	47.9	47.4	60.6	47.3	47.1	42.3	49.1	53.4
	% REC. 1	77.2	95.4	108	89	94.6	105	102	82.8	99.4	94.2	101	97.6	97.2	90.6	101	106
	% REC. 2	77	96	302	85.2	94	106	101	112	95.8	92.2	101	94.6	94.2	84.6	98.2	107
	RPD	0.229	0.627	33.2	4.36	0.636	0.261	1.19	19.8	3.69	2.09	0	3.12	3.13	6.85	3.01	0.563
LCD-5	Blank 4C01012-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel	LCS (50 mg/Kg)	46.7	45.5	47.9	42.7	46.9	48.4	48.2	47.8	47.5	45.0	47.7	44.4	48.3	48.2	48.1	47.5
MNB0757-01	% RECOVERY	93.4	91.0	95.8	85.4	93.8	96.8	96.4	95.6	95.0	90.0	95.4	88.8	96.6	96.4	96.2	95.0
Spike level:	Source Result	ND	27.0	340	ND	ND	76	0.94	14	ND	7.60	33	ND	ND	ND	ND	ND
50 mg/Kg	Matrix Spike 1	36.4	93.5	658	43.8	45.6	125	48.8	61.2	46.8	53.1	81.7	46.5	47.2	43.2	48.5	48.4
	Matrix Spike 2	36.5	86.2	556	42.8	45.4	115	48.3	58.4	46.2	52.2	76.7	45.2	46.9	44.2	47.7	48.6
	% REC. 1	72.8	133	636	87.6	91.2	98.0	95.7	94.4	93.6	91.0	97.4	93.0	94.4	86.4	97.0	96.8
	% REC. 2	73.0	118	432	85.6	90.8	78.0	94.7	88.8	92.4	89.2	87.4	90.4	93.8	88.4	95.4	97.2
	RPD	0.274	8.12	16.8	2.31	0.44	8.33	1.03	4.68	1.29	1.71	6.31	2.84	0.638	2.29	1.66	0.412
Plasma TV-1	Blank 4C16012-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel Outer	LCS (50 mg/Kg)	47	47	47.8	42.7	47.8	49	48.6	47.5	48.5	46	48.8	46	49.1	47.2	48.6	48
MNB0739-01	% RECOVERY	94	94	95.6	85.4	95.6	98	97.2	95	97	92	97.6	92	98.2	94.4	97.2	96
Spike level	Source Result	14.0	ND	ND	ND	ND	75	2.00	1800	ND	2.20	35	ND	ND	ND	ND	130
50 mg/Kg	Matrix Spike	53.2	48.7	50.2	43.2	46.7	117	51.8	1660	49.5	48.6	80.8	44.2	48.3	45.8	48.6	203
	Matrix Spike Duplicate	53.8	49.8	50.6	43.4	47.3	137	51.1	1540	50.3	49.5	91.4	45.8	49.1	46.8	49.5	182
	% REC. 1	78.4	97.4	100	86.4	93.4	84	99.6	NR	99	92.8	91.6	88.4	96.6	91.6	97.2	146
	% REC. 2	79.6	99.6	101	86.8	94.6	124	98.2	NR	101	94.6	113	91.6	98.2	93.6	99	104
	RPD	1.12	2.23	0.794	0.462	1.28	15.7	1.36	7.5	1.6	1.83	12.3	3.56	1.64	2.16	1.83	10.9
Plasma TV-4	Blank 4C16033-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel Inner	LCS (50 mg/Kg)	48.4	47.1	48.1	43.9	48	49.8	49.3	46.5	50.2	47.9	49.4	45.9	49.1	46.9	49.3	48.6
MNC0167-12	% RECOVERY	96.8	94.3	96.2	87.8	96	99.6	98.6	93	100	95.8	98.8	91.8	98.2	93.8	98.6	97.2
Spike level	Source Result	ND	ND	21	ND	ND	26	ND	ND	4300	ND	14	ND	84	ND	ND	90
50 mg/Kg	Matrix Spike	163	51.2	848	45.1	51.8	100	53.2	61.4	57.4	51.2	70.8	47.7	51.4	51.2	51.6	53.6
	Matrix Spike Duplicate	178	53.4	909	45.9	52	105	53.4	69.2	58	52.2	73	51.6	51.4	50.9	51.8	54.4
	% REC. 1	326	102	NR	90.2	104	148	106	123	NR	102	114	95.4	NR	102	103	NR
	% REC. 2	356	107	NR	91.8	104	158	107	138	NR	104	118	103	NR	102	104	NR
	RPD	8.8	4.21	6.94	1.76	0.385	4.88	0.375	11.9	1.04	1.93	3.06	7.85	0	0.588	0.387	1.48

Appendix B. Table QC-I: Quality Control for Total Concentrations - Continuation

Collector's ID		Sb	Ar	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Th	V	Zn
LCD-TV1	Blank 4D12019-BLKB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel	LCS (50 mg/Kg)	49	50.2	51.1	48.8	51.4	52.3	52.1	53	52.4	49.4	51.9	49.4	50.8	52.5	51.8	52.2
Outer	% RECOVERY	98.6	100	102	97.6	103	105	104	106	105	98.8	104	98.8	102	105	104	104
MNC0812-01	Source Result	ND	28	340	ND	ND	57	ND	34	ND	1.6	22	ND	ND	ND	ND	ND
Spike level	Matrix Spike	40.3	82.3	507	45.3	46.7	97.6	48.3	100	51.2	46	68.6	45.9	47	47.1	48.3	54.4
50 mg/L	Matrix Spike Dup	41.1	83	490	46.2	48	111	48.9	103	51.2	46.6	71.2	45.4	47.5	47.7	48.4	55.7
	% REC. 1	80.6	109	334	90.6	93.4	81.2	96.6	132	102	88.8	93.2	91.8	94.0	94.2	96.6	109
	% REC. 2	82.2	110	300	92.4	96.0	108	97.8	138	102	90.0	98.4	90.8	95.0	95.4	96.8	111
	RPD	1.97	0.847	3.41	1.97	2.75	12.8	1.23	2.96	0	1.3	3.72	1.1	1.06	1.27	0.207	2.36
LCD-TV3	Blank 4d23023-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD RemCont	LCS (50 mg/Kg)	47.2	45.1	47.7	45.9	47.4	48	47.9	47.2	47.6	44.9	47.7	44.5	47.9	47	47.8	47.7
PC Board	% RECOVERY	94.4	90.2	95.4	91.8	94.8	96	95.8	94.4	95.2	89.8	95.4	89	95.8	94	95.6	95.4
MNC0812-30	Source Result	23	ND	140	0.57	ND	17	12	270000	3400	ND	3200	ND	58	ND	ND	2400
Spike level	Matrix Spike 1	46.8	21	146	44.8	41.4	61.3	57.5	304000	4970	21.9	2740	28	83.2	38.5	ND	12900
50 mg/L	Matrix Spike 2	54.7	32.3	519	42.9	43.4	71.4	60.2	58500	6950	19.6	5530	20.6	150	42.9	ND	4020
	% REC. 1	47.6	42	12	88.5	82.8	88.6	91.0	NR	NR	43.8	NR	56	50.4	77		NR
	% REC. 2	63.4	64.6	758	84.7	86.8	109	96.4	NR	NR	39.2	NR	41.2	184	85.8		NR
	RPD	15.6	42.4	112	4.33	4.72	15.2	4.59	135	33.2	11.1	67.5	30.5	57.3	10.8		105

Appendix B. Table QC-II: Quality Control for WET-extractable Elements

Collector's ID		Al	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Th	V	Zn
LCD TV-4	Blank 4C15006-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCFL	LCS (2 mg/Kg)	2.02	1.98	1.95	1.9	1.99	1.99	1.98	1.96	1.98	1.99	2	2.03	1.96	2.1	1.97	2.01
	% RECOVERY	101	99	97.5	97	99.5	99.5	99	98	99	99.5	100	102	98	104.0	98.5	100
Spike level	Source Result	ND	ND	6.9	ND	ND	0.064	0.06	0.41	250	ND	0.05	ND	ND	ND	ND	2
2 mg/L	Matrix Spike	1.9	1.7	9.27	1.84	1.99	1.96	1.94	2.33	242	1.88	1.93	1.61	1.89	1.9	1.87	3.59
	Matrix Spike Duplicate	1.95	2.05	8.94	1.85	1.96	1.99	1.96	2.35	241	1.9	1.94	2.04	1.96	1.97	1.91	3.51
	% REC. 1	95	85	118	92	95	94.8	94	96	-400	94	94	80.5	94.5	92.5	93.5	99.5
	% REC. 2	97.5	102	102	92.5	98	96.3	95	97	NR	95	94.5	102	98	98.5	95.5	95.5
	RPD	3.6	18.7	3.62	0.542	3.11	1.52	1.03	0.855	0.414	1.06	0.517	23.6	3.64	6.28	2.12	2.25
LCD-5	Blank 4C02004-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel	LCS (2 mg/Kg)	1.88	1.83	1.86	1.88	1.92	1.93	1.92	1.85	1.93	1.89	1.94	1.85	1.88	1.90	1.90	1.93
MNB0757-01	% RECOVERY	94.0	91.5	93.0	94.0	96.0	96.5	96.0	92.5	96.5	94.5	97	92.5	94.0	95.0	95.0	96.5
Spike level:	Source Result	ND	0.12	1.1	ND	ND	0.034	0.017	0.17	ND	ND	0.058	ND	ND	ND	ND	0.037
2 mg/L	Matrix Spike 1	1.92	2.0	2.95	1.89	1.9	1.96	1.93	2.03	1.95	1.88	1.98	2.00	1.37	1.92	1.89	1.95
	Matrix Spike Duplicate	1.91	1.79	2.96	1.89	1.90	1.95	1.93	2.03	1.92	1.88	1.98	1.92	1.36	1.94	1.89	1.95
	% REC. 1	96.0	93.0	92.5	94.5	95.5	96.3	95.6	93.0	97.5	94.0	96.10	100	68.5	96.0	94.5	95.6
	% REC. 2	95.5	83.5	93	94.5	95	95.8	95.6	93.0	96.0	94.0	96.1	96.0	68.0	97.0	94.5	95.6
	RPD	0.522	10.1	0.338	0	0.525	0.512	0	0	1.55	0	0	4.08	0.733	1.04	0	0
Plasma TV-1	Blank 4C18004-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel Outer	LCS (2 mg/Kg)	2.02	1.95	1.99	1.99	2.04	2.04	2.03	1.98	1.91	2.01	2.04	2.08	2.02	2.05	2.01	2.04
MNB0739-01	% RECOVERY	101	97.5	99.5	99.5	102	102	102	99	95.5	100	102	104	101	102	100	102
Spike level	Matrix Spike	2	2.05	1.96	1.94	1.98	2.03	2.12	14.5	2.17	2.04	2.06	2.01	1.93	1.98	1.95	6.9
2 mg/L	Matrix Spike Duplicate	2.03	1.94	1.98	1.95	1.99	2.04	2.12	14.6	2.15	2.04	2.05	2.02	1.94	2.05	1.97	6.9
	% REC. 1	100	102	95.2	97	98.6	98.7	99	75	107	98.6	99.6	100	95.4	99	97	85
	% REC. 2	102	97	96.2	97.5	99.1	99.2	99	80	106	98.6	99.2	101	95.8	102	98	85
	RPD	1.49	5.51	1.02	0.514	0.504	0.491	0	0.687	0.926	0	0.487	0.496	0.517	3.47	1.02	0
Plasma TV-4	Blank 4C22011-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel Inner	LCS (2 mg/Kg)	1.99	1.98	1.94	1.97	1.97	2	1.99	1.96	1.88	1.95	2.01	1.96	1.94	1.93	1.98	1.99
MNC0167-12	% RECOVERY	99.5	99	97	98.5	98.5	100	99.5	98	94	97.5	100	98	97	96.5	99	99.5
Spike level	Source Result	nd	nd	4.3	nd	nd	0.035	0.015	0.13	520	nd	0.31	nd	0.015	nd	0.02	16
2 mg/L	Matrix Spike	1.82	1.89	6.31	1.87	1.89	1.94	1.92	1.99	540	1.87	2.23	1.72	1.85	1.8	1.89	18.2
	Matrix Spike Duplicate	1.91	1.79	6.04	1.91	1.91	1.97	1.95	2	535	1.93	2.25	1.84	1.88	1.87	1.93	17.3
	% REC. 1	91	94.5	100	93.5	94.5	95.2	95.2	93	1000	93.5	96	86	91.8	90	93.5	110
	% REC. 2	95.5	89.5	87	95.5	95.5	96.8	96.8	93.5	750	96.5	97	92	93.2	93.5	95.5	65
	RPD	4.83	5.43	4.37	2.12	1.05	1.53	1.55	0.501	0.93	3.16	0.893	6.74	1.61	3.81	2.09	5.07
LCD 1	Blank 4A19009-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
LCD Panel	LCS (2 mg/Kg)	2.00	2.21	1.97	2.0	2.04	2.03	1.97	2.00	1.96	1.98	2.02	1.97	1.99	2.05	1.97	2.03
MMLO779-01	% RECOVERY	100	110	98.5	98.5	102	102	98.5	100	98.0	99.0	101	98.5	99.5	102	98.5	102
Spike level	Source Result	1.7	ND	1.5	ND	ND	ND	0.64	ND	ND	ND	ND	ND	0.041	ND	0.15	ND
2 mg/L	Matrix Spike	3.55	2.08	3.43	1.95	1.99	2.02	2.57	2.02	2.01	1.98	2.10	1.49	1.98	2.03	2.13	1.96
	Matrix Spike Dup	3.69	2.08	3.54	1.97	2.01	2.06	2.63	2.05	2.10	1.99	2.14	1.51	2.11	1.96	2.17	1.98
	% REC. 1	92.5	104	96.5	97.5	99.5	101	96.5	101	100	99.0	105	74.5	97	102.0	98.0	99.0
	% REC. 2	99.5	104	102	98.5	100	103	99.5	102	105	99.5	107	75.5	103	98.0	99.0	101
	RPD	3.87	0	3.16	1.02	1	1.96	2.31	1.47	4.38	0.504	1.89	1.33	6.36	3.51	1.02	1.86

Appendix B. Table QC-II: Quality Control for WET-extractable Elements - Continuation

Collector's ID		Al	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Se	Ag	Th	V	Zn
LCD-TV1	Blank 4D12002-BLK1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Glass Panel	LCS (2 mg/Kg)	1.89	1.97	1.92	1.93	1.94	1.96	1.96	1.95	2.18	1.93	1.97	1.80	1.91	2.02	1.92	1.97
Outer	% RECOVERY	94.5	98.5	96.0	96.5	97.0	98.0	98.0	97.5	109	96.5	98.5	90.0	95.5	101	96.0	98.5
MNC0812-01	Source Result	ND	0.20	3.00	ND	ND	0.042	0.012	0.52	0.23	ND	0.088	ND	0.0076	ND	ND	0.54
Spike level:	Matrix Spike 1	1.98	2.14	4.87	1.98	1.97	2.05	2.01	2.47	2.26	1.98	2.10	1.95	1.39	2.00	1.98	2.52
2 mg/L	Matrix Spike 2	1.99	2.26	4.87	2.00	1.98	2.05	2.02	2.47	2.27	2.00	2.13	2.00	1.42	2.04	1.99	2.53
	% REC. 1	99.0	97.0	93.5	99.0	98.5	100	99.9	97.5	102	99.0	101	97.5	69.1	100	99.0	99.0
	% REC. 2	99.5	103	93.5	100	99.0	100	100	97.5	102	100	102	100	70.6	102	99.5	99.5
	RPD	0.504	5.45	0.00	1.01	0.506	0.00	0.496	0.00	0.442	1.01	1.42	2.53	2.14	1.98	0.504	0.396

Appendix B. Table QC-III: Quality Control for TCLP-extractable Elements

Collector's ID		As	Ba	Cd	Cr	Pb	Se	Ag
LCD-1	Blank 4A14026-BLK1	ND	ND	ND	ND	ND	ND	ND
LCD Panel	LCS(0.800 mg/L)	0.2	4	0.02	0.4	1	0.2	0.4
MML0779-01	% RECOVERY	105	97.2	106	106	106	98.6	105
Spike Level	Source Result	ND	0.4	ND	ND	ND	ND	ND
0.800 mg/L	Matrix Spike 1	0.806	1.21	0.79	0.786	0.841	0.748	0.748
	Matrix Spike 2	0.88	1.27	0.836	0.834	0.879	0.809	0.789
	% REC. 1	101	101	98.8	98.2	105	93.5	93.5
	% REC. 2	110	109	104	104	110	101	98.6
	RPD	8.78	4.84	5.66	5.93	4.42	7.84	5.34
LCD-5	Blank 4C01013-BLK1	ND	ND	ND	ND	ND	ND	ND
Glass Panel	LCS (0.800 mg/Kg)	0.874	0.761	0.809	0.791	0.792	0.798	0.782
MNB0757-01	% RECOVERY	109	95.1	101	98.9	99	99.8	97.8
Spike Level	Source Result	ND	0.35	ND	0.01	0.02	ND	ND
0.800 mg/L	Matrix Spike 1	0.866	1.10	0.803	0.791	0.791	0.818	0.784
	Matrix Spike 2	0.918	1.13	0.825	0.807	0.818	0.823	0.804
	% REC. 1	108	93.8	100	97.6	96.4	102	98.0
	% REC. 2	115	97.5	103	99.6	99.8	103	100
	RPD	5.83	2.69	2.7	2	3.36	0.609	2.52
Plasma TV 2	Blank 4C19024-BLK1	ND	ND	ND	ND	ND	ND	ND
PC Board	LCS(0.800 mg/L)	0.86	0.752	0.797	0.794	0.792	0.819	0.780
MNB0739-09	% RECOVERY	108	94.0	99.6	99.2	99.0	102	97.5
Spike Level	Source Result	ND	1.7	ND	0.016	74	ND	ND
0.800 mg/L	Matrix Spike 1	0.826	2.46	0.79	0.80	77.1	0.785	0.769
	Matrix Spike 2	0.766	2.36	0.747	0.758	73.9	0.738	0.726
	% REC. 1	103	95	98.8	98	387	98.1	96.1
	% REC. 2	95.8	82.5	93.4	92.8	NR	92.2	90.8
	RPD	7.54	4.15	5.60	5.39	4.24	6.17	5.75
Laptap-2T	Blank 4A14026-BLK1	ND	ND	ND	ND	ND	ND	ND
LCD Panel	LCS (0.800 mg/Kg)	0.882	0.815	0.852	0.832	0.846	0.834	0.811
MML0779-43	% RECOVERY	110	102	106	104	106	104	101
Spike Level	Source Result	ND	0.74	ND	ND	0.13	ND	ND
0.800 mg/L	Matrix Spike 1	0.858	1.41	0.784	0.772	0.906	0.73	0.74
	Matrix Spike 2	0.847	1.35	0.755	0.744	0.861	0.709	0.709
	% REC. 1	107	83.7	98.0	96.5	97.0	91.2	92.5
	% REC. 2	106	76.2	94.4	93	91.4	88.6	88.6
	RPD	1.29	4.35	3.77	3.69	5.09	2.92	4.28
LCD TV1	Blank 4D14025-BLK1	ND	ND	ND	ND	ND	ND	ND
Glass Panel	LCS (0.800 mg/Kg)	0.800	0.763	0.764	0.773	0.784	0.785	0.757
MNC0812-01	% RECOVERY	100	95.4	95.5	96.6	98.0	98.1	94.6
Spike Level	Source Result	ND	0.43	ND	0.0063	0.061	ND	ND
0.800 mg/L	Matrix Spike 1	0.77	1.17	0.702	0.715	0.766	0.753	0.693
	Matrix Spike 2	0.86	1.30	0.781	0.795	0.85	0.857	0.768
	% REC. 1	96.2	92.5	87.8	88.6	88.1	94.1	86.6
	% REC. 2	108	109	97.6	98.6	98.6	107	96
	RPD	11	10.5	10.7	10.6	10.4	12.9	10.3

Appendix B. Table QC-IV: Quality Control for Total Hg in CCFL

Collector's ID	TOTAL Hg	
LCD-4	Blank4A22017-BLK1	ND
CCFL	LCS (spiked 8.0ug/L)	8.07
MML0779-20	%Recovery	101
Spike Level	Source Results	32000
2000ug/Kg	Matrix Spike	39200
	Matrix Spike Duplicate	56500
	% REC. 1	360
	% REC. 2	NR
	RPD	NR
LCD TV-4	Blank 4C16018-BLK1	ND
CCFL	LCS (8.0ug/L)	7.74
MNC0167-18	% Recovery	96.8
Spike Level	Source Result	440000
2000ug/Kg	Matrix Spike	521000
	Matrix Spike Duplicate	506000
	% REC. 1	NR
	% REC. 2	NR
	RPD	2.92
LCD-5	Blank 4C01022-BLK1	ND
CCFL	LCS (2000 ug/L)	1980
MNB0757-02	% RECOVERY	99.0
Spike Level	Source Result	43000
2000ug/Kg	Matrix Spike 1	69100
	Matrix Spike 2	114000
	% REC. 1	NR
	% REC. 2	NR
	RPD	NR

Collector's ID	Total Hg	
LCD-7	Blank4D16020-BLK1	ND
CCFL	LCS (Spike 8.0 ug/L)	7.04
MNC-0812-23	% Recovery	88
Spike Level	Source results	190000
667 ug/Kg	Matrix Spike	144000
	Matrix Spike Duplicate	58700
	% REC. 1	NR
	% REC. 2	NR
	RPD	NR

* = QB02 - The method blank contains this analyte at a concentration above the method reporting limit. This should be considered in evaluating the date for its intended purpose.

Appendix B. Table QC-V: Quality Control for Hg in non CCFL components

Collector's ID	TCLP-extractable Hg	
LCD-5	Blank 4C01033-BLK1	ND
Glass Panel	LCS(8 ug/L)	7.14
MNB0757-01	% RECOVERY	89.2
Spike Level	Source Result	ND
8 ug/L	Matrix Spike 1	8.76
	Matrix Spike 2	7.86
	% REC. 1	110
	% REC. 2	98.2
	RPD	10.8
LCD-5	Blank 4D14026-BLK1	ND
Glass Panel	LCS(8.0 ug/L)	7.18
MNC0812-01	% RECOVERY	89.8
Spike Level	Source Result	ND
8.0ug/L	Matrix Spike 1	5.5
	Matrix Spike 2	4.48
	% REC. 1	68.8
	% REC. 2	56.0
	RPD	20.4

Collector's ID	WET-extractable Hg		Collector's ID	WET-extractable Hg	
LCD-5	Blank 4C01034-BLK1	ND	LCD-1	Blank 4A19032-BLK1	ND
Glass Panel	LCS (200 ug/L)	205	LCD Panel	LCS (200 ug/L)	198
MNB0757-01	% RECOVERY	102	MML0779-01	% RECOVERY	99
Spike level	Source Result	2.1	Spike level	Source Result	ND
200 mg/L	Matrix Spike 1	208	200 mg/L	Matrix Spike	200
	Matrix Spike 2	164		Matrix Spike Duplicate	201
	% REC. 1	103		% REC. 1	100
	% REC. 2	81.0		% REC. 2	100
	RPD	23.7		RPD	0.5
Plasma TV-1	Blank 4C18004-BLK1	ND	LCD-3	Blank 4A23003-BLK1	ND
Glass Panel Outer	LCS (200 ug/L)	184	printed circuit boa	LCS (4.0ug/L)	3.96
MNB0739-01	% RECOVERY	92	MML0779-15	% RECOVERY	99
Spike level	Source Result	3.1	Spike level	Source Result	ND
200 mg/L	Matrix Spike	190	200 mg/L	Matrix Spike	193
	Matrix Spike Duplicate	187		Matrix Spike Duplicate	183
	% REC. 1	93.4		% REC. 1	96.5
	% REC. 2	92		% REC. 2	91.5
	RPD	1.59		RPD	5.32
Plasma TV-4	Blank 4C23034-BLK1	ND	LCD-5	Blank 4D15015-BLK1	ND
Glass Panel Inner	LCS (200 ug/L)	198	Glass Pnel Outer	LCS (200 ug/L)	198
MNC0167-12	% RECOVERY	99	MNC0812-01	% RECOVERY	99
Spike level	Source Result	0.042	Spike level	Source Result	1
200 mg/L	Matrix Spike	196	200 mg/L	Matrix Spike	156
	Matrix Spike Duplicate	201		Matrix Spike Duplicate	153
	% REC. 1	98		% REC. 1	77.5
	% REC. 2	100		% REC. 2	76
	RPD	2.52		RPD	1.94

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