

4 End-of-Life Management of Electronics in the US

Concern about electronic waste is rising in the United States, driven by two major factors. First, municipal waste systems are being overwhelmed by rapidly growing quantities of discarded electronic equipment that is expensive to manage because of its toxic constituents. Second, regulations are being implemented in Europe and Asia that require producers to take back and reuse or recycle their electronic equipment at end of life, raising the question of whether such regulations should be implemented in the US as well.

In this chapter, we look at how the electronic waste management problem is being addressed in the US. (Chapter 5 describes policies and programs for end-of-life management of electronics abroad.) While some of the programs described involve a wide range of electronic products, including cell phones and other wireless devices, the focus at present is on computers. However, the same issues pertain to all discarded electronics, so even those programs that do not specifically address waste from wireless devices provide insights into how these products might be managed at end of life. It is also important to note that wireless products are distinctive in one way that could have significant implications for their end-of-life management: because they are so small, they may require different types of collection systems than those used to manage heavy products that contain CRTs.

According to INFORM's estimates, about 130 million cell phones will be retired each year in the US by 2005 and over 500 million cell phones will be stockpiled — that is, stored away in drawers, closets, and attics. Ultimately, all this equipment will enter the municipal waste stream.

Cell phones and other wireless devices are a particular problem because, like personal computers, they contain precious metals and many toxic components. These products should not be disposed of in landfills or burned in incinerators, but because they are so small, it is difficult to prevent them from being thrown out in the trash. The challenge is to develop systems that recover the highest possible value from these products after they are discarded, and that reduce the risk of damage to the environment and public health resulting from their end-of-life management. At present, retired cell phones do have some value. Hobi International, Inc., an electronics recycler, pays to take back old phones mainly because of the high percentage that can be sold for reuse.¹

Before considering end-of-life options, it is useful to point out that cell phones are retired and replaced primarily because of marketing factors. Since phones are dedicated to a particular service provider, users who change providers usually must get a new phone even if the old one works perfectly well. Service contracts typically last one year, and even users who renew with the same provider often have an incentive to replace their current phone. For example, in the summer of 2001, AT&T offered a free Nokia phone and \$80 worth of rebates along with its standard service contract — thus, choosing to get a new phone actually earned customers \$80. As a result, many phones are being discarded that are in good working order and suitable for reuse.

Programs to Refurbish and Reuse Cell Phones

A number of programs in the US promote the refurbishment and reuse of cell phones. These terms are used as follows throughout this chapter:

- **Refurbishment:** the cleaning, reprogramming, and/or repair of a product.
- **Reuse:** the reapplication of a product that retains its original form or identity.

Refurbishment and reuse extend the utility of products and prevent functional products from being disposed of as waste. Some examples of programs in the US include the following:

- **CAP Inc.** (Computers Assisting People Inc.) CAP has been collecting used cell phones throughout Ohio since February 2001. The program grew out of the group's success collecting used computer equipment, parts, and software and donating them to nonprofit organizations. It primarily targets businesses (where CAP's phone collection containers are located), but has also begun to target community social groups in order to promote individual phone donations. Collected phones are sent to Motorola and are either recycled or refurbished, depending on the item's condition. Refurbished phones are preprogrammed to dial 911 and several other numbers, and are given to victims of domestic violence and to "families at risk" (determined by local police agencies and shelters). CAP has collected almost 1000 cell phones since the program's inception.² For more information, see <http://www.capinc.org/capfone.htm>.
- **CollectiveGood International.** Participants in this program donate their used phones to charities, which sell them to CollectiveGood. The organization then refurbishes and sells them at 33 to 50 percent below the cost of a new phone. It targets developing countries where the average per capita income is under \$3000 per year (particularly in Latin America, where networks use the same cellular standards as in the US). CollectiveGood partners with charities such as CARE, and also with entities such as the Rechargeable Battery Recycling Corp. and Waste Management Inc.'s Asset Recovery Group, which respectively recycle batteries and phones that cannot be reused.³ Launched in December 2000, CollectiveGood has collected 10,000 to 11,000 phones to date.⁴ For more information, see <http://www.collectivegood.com>.
- **Donate a Phone — Call to Protect.** These programs, run by the Wireless Foundation, have collected approximately 800,000 cell phones since September 1999. In Call to Protect, which began in 1996 (Motorola was the sponsor), phones and airtime are donated to victims of domestic abuse. Donate a Phone was established as an adjunct to Call to Protect to obtain more phones. Of the 800,000 phones collected so far, approximately one-third have been recycled. Approximately 60,000 usable phones have been given new batteries and sent to shelters for victims of domestic violence. The remaining phones have been refurbished and sold through ReCellular Inc. (described below). Revenues generated from phone sales are used to acquire new phones and refurbish used phones, and in program support and development.⁵ For more information, see <http://www.wirelessfoundation.org>.
- **HopeLine.** Since its inception in 2001, this community service program, run by Verizon Wireless, has collected thousands of previously owned cell phones at the company's 1200-plus stores nationwide.⁶ Verizon collects all brands of used phones, which are then refurbished, recycled, and/or sold, depending on the unit's condition.⁷ Phones that can be refurbished are preprogrammed to dial 911 and one other number, generally a community police station or shelter, and provided to people in need of emergency services, such as domestic violence victims, crossing guards, and the elderly.⁸ Proceeds from phone sales are donated to nonprofit domestic violence advocacy organizations and are used to purchase wireless handsets for abuse victims. A 10-week trial of the program in Georgia and on the company's website during the summer of 2001 resulted in 8000 collected cell phones.⁹ For more information, call 1-800-426-2790.

- **New York City P.H.O.N.E.S.** (People Helping Others Needing Emergency Services). During a three-month period in 2000, the city collected over 22,000 cell phones at 300 sites for distribution to people in need of access to emergency services, such as victims of domestic violence, senior citizens, the homebound, livery cab drivers, school crossing guards, and neighborhood watch groups. The program was sponsored by Bell Atlantic (now part of Verizon Wireless), which preprogrammed the phones to call 911 only.¹⁰ For more information, see <http://www.nyc.gov/html/ccfv/html/phones.html>.
- **ReCellular Inc.** Established in 1991, ReCellular buys and sells thousands of cell phones and accessories per day, refurbishes them, and lists them for sale on its website. Phones range in price from \$29.95 to \$129.95 and include major brands such as Nokia, Ericsson, and Motorola. ReCellular buys phones only in bulk — its primary customers are wireless carriers (e.g., Bell South Mobility, GTE Wireless, MCI Worldcom Wireless, Nokia Mobile Phones, and SBC Communications) and their authorized retailers, dealers, and agents. The company provides a 90-day warranty on all phones sold.¹¹ For more information, see <http://www.recellular.com>.
- **Phones Under Warranty.** Most service contracts provide a warranty on cell phones for the duration of the contract, which is usually one year. If the phone breaks during this period, the subscriber can send it back to the service provider, which replaces it free of charge with a refurbished phone. Broken phones are repaired when possible and subsequently used as replacement units.
- **New Every Two** (Verizon Wireless). This program enables customers to trade in their old phone for a new one every two years. At the end of the two-year contract, Verizon provides customers with \$100 toward the purchase of a new phone. The customer must send back the old phone and renew the service contract with Verizon for another two years. In response to criticism that the program is wasteful, Verizon responds that the average wireless customer gets a new phone every 18 months anyway, and its program actually encourages people to keep their phones longer. Verizon refurbishes hundreds of thousands of returned phones each year and puts them back into service as replacement units.¹² For more information, see http://www.verizonwireless.com/special_offers/new_every_two/index.html.

Recycling of Cell Phones and Other Wireless Devices

In this chapter, the term “recycling” is used as follows:

- **Recycling:** the disassembly and processing of a product into raw materials that are used to make new products.*

Recycling of cell phones is in its infancy. Some electronics recyclers are beginning to process cell phones, but they accept bulk shipments only — not single phones from individual consumers. Communities or producers that collect used phones can consolidate them and use these recyclers’ facilities.

United Recycling of Franklin Park, Illinois, was established in the 1950s to recover precious metals. The company now has three units: United Recycling Services, which disassembles the equipment; Universal Integrated Circuits, which recovers and resells the usable chips; and United Refining and Smelting Co., which recovers the precious metals.

* The distinction between recycling and remanufacture — the cleaning, repair, replacement, and reassembly of parts into a product in sound working condition — is often hazy. In the context of electronic products, remanufacturing would include removing the circuit boards from used equipment and using them in new products. In this report, remanufacture is included under recycling.

United processes a wide variety of electronic equipment, including cell phones. All electronic waste received is evaluated to maximize recovered value. Items that can be reused and sold are identified and marketed. However, the company will destroy products at the request of customers, who may wish to protect proprietary design features, prevent damage to their brands' reputation from lower-quality products, or protect the market for new products. United will also recover parts for customers' spare parts inventories.

All materials containing integrated circuits (ICs) are sent to Universal Integrated Circuits for recovery. There is a substantial market for ICs, which are generally sold abroad to small manufacturers of lower-value products such as off-brand computers and electronic games and toys. The remaining materials go to United Refining and Smelting for recovery of precious metals such as gold, silver, platinum, palladium, and copper. Base metals, plastics, cardboard, and other materials are sold on the commodities market.

United also operates a take-back program for computer and fax equipment, available to consumers in Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin, at a cost of \$27.99 per unit. Compaq Computer gives participants in this program a discount of 6 to 9 percent off the purchase price of a new computer.¹³ For more information, go to <http://www.unitedrecycling.com>.

Fox Electronics of San Jose, California, was established in 1984 to recover integrated circuits from printed wiring boards for redistribution back into electronics manufacturing. It now offers a range of recycling services, including precious metals recovery. Like United, Fox will destroy materials at the request of customers, and provides a certificate guaranteeing that these items will never "resurface." Fox will also set up and operate take-back services, because the company believes it is only a matter of time before take-back mandates similar to those in Europe are proposed in the US.

Fox claims to be the world's largest processor of used integrated circuits, removing, refurbishing, repackaging, and reselling over two million per month. According to Fox, it can provide a higher return on scrap printed wiring boards than can precious metal refineries because the value of the component ICs is far greater than that of the precious metals. Its IC inventory is posted on the Internet, and its used chips come with a "100% unconditional guarantee for form, fit and function,"¹⁴ while selling for 20 to 30 percent less than new.¹⁵ Fox returns to its customers 60 to 70 percent of the revenues generated from the resale of ICs.¹⁶

To date, Fox has primarily recycled computer equipment. It is not currently recycling cell phones but may do so in the future. The company has recycled personal digital assistants (e.g., Palm Pilots). For more information, go to <http://www.foxelectronics.com>.

As the examples of United Recycling and Fox Electronics indicate, the materials recovered from cell phones and other wireless devices at end of life are the precious metals and integrated circuits they contain. Plastics, however, which account for about one-third the weight of a cell phone handset,¹⁷ are not being recycled. This is because they contain additives (including brominated flame retardants, discussed in detail in chapter 3) that can contaminate the recycled materials and destroy their value. Debate on plastics recycling has gone on for years, with recyclers calling for manufacturers to facilitate recycling by standardizing and labeling the resins used, and manufacturers arguing that recyclers should develop better separation methods and that standardization of materials will impede their ability to "meet the needs of tomorrow."¹⁸

Voluntary Manufacturer Take-Back Initiatives

US companies are well aware that they will soon have to take back their electronic products in Japan and Europe, and that this will create strong pressures for them to take similar action in the US. Spurred by the EU's forthcoming *Directive on Waste Electrical and Electronic Equipment* (see chapter 5 for a discussion of the WEEE directive), and by the threat of state legislation in the US, some companies are voluntarily initiating take-back programs in hopes of staving off similar mandates here. While these programs tend to focus on computers, some include cell phones and all are instructive in providing potential models for the end-of-life management of small, wireless electronic devices.

In evaluating these initiatives, it is useful to consider how they address some key issues that have been at the heart of the debate on take-back in Europe. These include:

- Who pays to collect the materials and transport them to recyclers?
- Who pays for recycling?
- Are there any recycling targets?
- Are there any reporting requirements?
- Is take-back free to the end user?

Computer Take-Back by Manufacturers

IBM unveiled its take-back program in November 2000. For a fee of \$29.99 per unit, the company will take back computers made by any manufacturer from individuals and small businesses. IBM provides a prepaid shipping label, but owners must pack the equipment themselves and bring it to a UPS location. Computers are shipped to Envirocycle, an electronics recycling company in Pennsylvania, which donates working units through the nonprofit Gifts in Kind International and recycles the remainder. This program has not met with great success: only 1000 computers were returned during the first six months of the program's operation.¹⁹ Packing and shipping the equipment is inconvenient, and consumers are reluctant to pay IBM's fee when localities will generally pick up discarded computers for free. For more information, go to <http://www.ibm.com/ibm/environment/products/prp.phtml>.

Hewlett-Packard launched its take-back program, which is very similar to IBM's, in May 2001. The company will take back equipment made by any manufacturer for a fee ranging from \$13 to \$34, depending on the component. Consumers must box the equipment, but FedEx will pick it up at their door. Equipment is shipped to HP facilities in California and Tennessee for recycling by MicroMetallics. HP has not released any data on the amount of equipment it is getting back through this program. For more information, go to <https://warp1.external.hp.com/recycle>.

Compaq has partnered with United Recycling on its take-back program. For \$27.99, consumers receive a shipping label and must then pack up and drop off the equipment at a UPS location. UPS delivers the used equipment to United Recycling. The program operates only in seven midwestern states: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Wisconsin.²⁰

Gateway has taken a different approach. Purchasers of a new Gateway computer can either trade in their old equipment (as long as it has value) or donate it to a charitable organization and receive a rebate of up to \$50. It is the consumer's responsibility to identify a charity that will take the used equipment. Thus, Gateway provides an incentive to keep old computers out of storage or disposal facilities, but is not itself involved in their end-of-life management. The problem with this system is that charities are becoming reluctant to take used computers. For example, in May 2001, Goodwill Industries in California announced it would no longer accept donations of computers, TVs, and cell phones, citing the prohibitive costs of repair, recycling, and disposal.²¹

Dell has a number of programs that recover used computer equipment:

- Trade-ups: consumers can redeem the value of used computers and peripherals of any brand and use the redemption amount to offset the price of a new Dell computer.²² For more information, go to <http://www.delltradeups.com>.
- Auction: Dell runs an on-line auction similar to eBay for buying and selling used computer equipment of any brand.²³ For more information, go to <http://www.dellauction.com>.
- Exchange: in partnership with the National Christina Foundation, Dell accepts used computer equipment and provides it to the economically disadvantaged, students at risk, and people with disabilities.²⁴ For more information, go to <http://www.cristina.org/dsf/dell.ncf>.

Intel, which is not a computer maker but rather a major supplier of parts to manufacturers of electronic products, will arrange for students to refurbish used computers, which are then given to schools and nonprofit organizations. This program, called StRUT (students recycling used technology), has refurbished over 24,000 computers.²⁵ For more information, go to <http://www.strut.org>.

Take-Back by Manufacturers of Other Electronic Equipment

In October 2000, Sony launched a take-back program for all its branded products, including cell phones.²⁶ The company described its "We Make It, We Take It" initiative as a five-year program that would begin in Minnesota, expand to five other states during 2001, and go national by 2004. (The program is an outgrowth of government initiatives in Minnesota to involve manufacturers in the management of electronic waste. See "Government Action on End-of-Life Electronics" in this chapter.) Sony would initially subsidize the program but expected it to become profitable by 2005. However, budget constraints led the company to put the program on hold in 2001 and not to expand it as planned.

Sony's Minnesota program, which was in operation as of November 2001, is based on a partnership with the state and Waste Management Inc. (WMI). Individual municipalities run the collection program (which is free to end users), separate the products, and ship them to WMI facilities, where they are sorted into glass, plastics, and metals. Sony reuses the glass and WMI sells the plastics and metals.²⁷

In March 2001, Sony joined Panasonic and Sharp in a recycling program in Connecticut and New Jersey. Each manufacturer pays to recycle its own products, while the states pay the costs of collection, sorting, and transport to designated recyclers. This program, too, is free to the end user.

Analysis of Manufacturer Take-Back Schemes

INFORM's research indicates that making producers responsible for their products at end of life can result in products designed to be less wasteful and more recyclable. To be effective, such "extended producer responsibility" (EPR) programs must:

1. Focus specifically on the waste generated by end-of-life products.
2. Clearly define what financial responsibility producers have for the collection, transport, and recycling of their products at end of life.
3. Set meaningful targets for collection and recycling.
4. Differentiate recycling from technologies such as waste-to-energy conversion, in which materials are burned to recover energy.
5. Include reporting requirements and enforcement mechanisms.
6. Provide producers with incentives to design for reuse/recycling.
7. Provide consumers with incentives to return their used products.

All the programs described above specifically address waste, and in all of them producers are taking some financial responsibility for the end of life of their products. However, these are voluntary programs and none of them includes targets for collection and recycling. Nor do they define what counts as recycling, and they do not include reporting requirements or enforcement mechanisms. While some producers will pay the costs of recycling, most show no willingness to pay for the collection of used products and their transport to recyclers. In all of these programs, this is paid for either directly by consumers or by local government. In the few cases where the manufacturer collects used equipment, consumers are charged for the service.

Another problem relates to the export of electronic equipment collected for recycling. Much of this is being shipped to developing countries, where it is polluting the environment and damaging public health. The US is unique among the industrialized nations of the world in not having signed the Basel Convention – a United Nations treaty that limits the export of hazardous waste.²⁸

On the positive side, these programs indicate that manufacturers are beginning to address the fate of their products after consumers discard them. This is an important step forward. However, the absence of targets and reporting requirements means that companies can establish such programs and end up taking back very little. The danger is that, while not really contributing significantly to the management of their products at end of life, manufacturers will be able to use these initiatives to bolster the argument that no take-back legislation is needed in the US.

In Europe, mandated take-back programs usually require that take-back be free to the end user. Any fees imposed at end of life are considered a disincentive for consumers to return their used products. In this country, where IBM, Hewlett-Packard, and Compaq all charge consumers to participate in their programs, it may well turn out that little equipment is actually returned. Japan's mandated take-back program does permit manufacturers to impose end-of-life fees on consumers, and it will be interesting to see what impact these have on recovery rates.

Table 4.1 End-of-Life Electronics Management: US Manufacturer Programs vs. the EU's WEEE Directive*

	Who Pays Collection Costs?***	Who Pays Transport Costs?***	Who Pays Recycling Costs?***	Collection/ Recycling Targets?	Free to End User?	Brands Included	Reporting/ Enforcement Mechanisms?
IBM	Consumer	Consumer	Industry	No	No	All	No
Hewlett-Packard	Consumer	Consumer	Industry	No	No	All	No
Compaq	Consumer	Consumer	Industry	No	No	Own	No
Sharp/ Panasonic/ Sony	Government	Government	Industry	No	Yes	Own	No
Europe (WEEE Directive)	Industry	Industry	Industry	Yes	Yes	All	Yes

* This table refers to mandated take-back programs under the EU's forthcoming *Directive on Waste Electrical and Electronic Equipment* (WEEE). Also note that Gateway and Dell provide incentives for reuse in the US but do not operate take-back programs.

*** This column refers to direct payment of these costs only.

Source: INFORM, Inc.

In none of the voluntary take-back programs initiated by manufacturers in the US do producers assume the full costs of collection, transport, and recycling. In some of them consumers pay directly for getting materials to recyclers, in others local government pays. Thus, the companies initiating these programs have taken financial responsibility for recycling only.

This is an improvement over the prevailing system, in which government pays all the end-of-life management costs for used electronics. But since companies may soon be able to profit from recycling, the arrangement could mean that government – if it pays to collect and deliver materials to recyclers – will in effect be subsidizing those profits. A key goal of EPR is to give producers incentives, such as any financial benefits that might be gained from take-back, to design products that are more recyclable. But such profits will be problematic if government winds up paying a substantial portion of end-of-life management costs by supplying companies with free feedstock for their manufacturing operations.

Clearly, companies that pay to recycle their own products have the greatest incentive to design for recycling. Design strategies resulting in products that are more economically recyclable and that generate less waste include using fewer plastic resins, labeling the resins, using fasteners that are easier to take apart, and reducing toxic constituents. Sony, which is working to make the recycling of its products profitable, is pursuing all of these strategies.²⁹

Results of the joint initiative undertaken by Sony, Sharp, and Panasonic, in which each company pays the cost of recycling its own products, will provide important information on the economic feasibility of managing end-of-life products by brand. If this proves too expensive, companies may decide to pool their efforts and form producer responsibility organizations that recycle products of any brand. In that case, the major challenge will be to devise

a fee system that rewards companies that design for recyclability. In Europe, fees to fund the recycling of packaging waste have been based on material composition and weight. Such fees closely approximate the actual costs of recycling a particular package. But electronic equipment is far more complex, with each product containing hundreds of materials, and will require a more complex solution.

Retailer Take-Back

A number of retailers are participating in local take-back programs for electronic equipment. Best Buy Co., a large electronics retail chain, is the first to undertake such a voluntary initiative nationally.

The program, announced in April 2001, involves drop-off programs at selected Best Buy stores across the country. The company will accept almost all electronic products, irrespective of brand (See Appendix D. Best Buy describes its initiative as a take-back program for electronics, but some electrical products are also included.) Best Buy's goal is to hold a drop-off event at each site at least once a year.³⁰

Best Buy generally charges a fee for computer monitors (\$10 per unit) and TVs (\$15 to \$25 per unit), but all other items are accepted free of charge. At one event, no fees were charged; at another, each car used to transport returned equipment was charged an additional \$5.00. Best Buy is seeking partners in this program and has already lined up Panasonic, which expects to carry one quarter of the program costs.³¹ Toshiba and Compaq have each sponsored collection events at Best Buy stores.³²

As of November 2001, Best Buy had held collection events in ten stores in seven states. Most of the equipment collected so far has been computers and TVs, with consumers dropping off fewer than 100 cell phones. These were sent to CollectiveGood International (see "Programs to Reuse and Refurbish Cell Phones" in this chapter), which agreed to have the phones reused or recycled domestically. The Rechargeable Battery Recycling Corp. (see chapter 6) provided collection boxes at each event, so consumers could return spent batteries from their cell phones and other electronic devices. Batteries were sent to recyclers.³³

As noted above, manufacturers seem more willing to pay to recycle electronics than to collect and transport the materials to recyclers. The Best Buy program illustrates the role that retailers could play in bearing those costs. However, environmentalists (such as the Western Electronics Product Stewardship Initiative [WEPSI] and the GrassRoots Recycling Network) are concerned about the program's take-back fees and the infrequency of collection. They argue that take-back should be free, with any costs incorporated into the product purchase price, and that programs should offer more than one drop-off event at each site per year. Best Buy has certainly taken the lead with its voluntary collection program, but other retailers will have to play a role as well if the retail sector is to be a significant player in the collection of used electronic equipment.

Trade Association Involvement in End-of-Life Electronics

In addition to launching take-back programs of their own, electronics manufacturers are working collectively through the Electronics Industry Alliance (EIA), a trade association, to address the problem of end-of-life electronics. The EIA comprises over 2100 high-tech companies, including manufacturers of computers, semiconductors, circuit boards, telecommunications equipment, and consumer electronic products, and represents 80 percent of the \$550 billion US electronics industry.³⁴

In January 2001, the EIA launched its web-based Consumer Electronics Initiative, which provides information on charities and government programs that accept used electronic equipment from consumers. This program provides information only — it does not involve any financial contribution by industry to the end-of-life management of electronic products. For more information, go to <http://www.eiae.org>.

In October 2001, the EIA announced grants totaling \$100,000 for the implementation and study of different collection models for electronics from household sources. The companies funding this project are Canon, Hewlett-Packard, JVC, Kodak, Nokia, Panasonic, Philips Consumer Electronics North America, Sharp, Sony, and Thomson — almost all Japanese or European companies. Notably missing from the project are large US computer-makers such as IBM, Dell, Compaq, and Gateway.

The three grant recipients in the EIA project are the US Environmental Protection Agency, Region III (comprising Delaware, Pennsylvania, Maryland, Virginia, West Virginia, and the District of Columbia), the state of Florida, and the Northeast Recycling Council (comprising solid waste officials from Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont). The one-year pilot projects will involve implementing collection programs and evaluating data from government-funded curbside and drop-off collection programs and various retail collection models.³⁵

Corporate Give-Back

AT&T's "take-back" program is more accurately described as a give-back program. Instead of taking anything back itself, the company requires suppliers to take back the products they sell to AT&T. So far, this has included carpet, cables, switches, and cell phone batteries (but not cell phones themselves). AT&T's 500 wireless retail outlets also encourage customers to bring their used batteries back to the stores instead of throwing them away. The stores then mail the batteries to recyclers. AT&T believes that "the costs for this procedure are outweighed by the environmental benefit."³⁶

National Electronics Product Stewardship Initiative

The National Electronics Product Stewardship Initiative (NEPSI) is a national multi-stakeholder dialogue begun in April 2000. In the face of threatened legislation in a number of states and abroad, its goal is to reach agreement on how end-of-life electronic equipment should be managed in the US. Industry favors a voluntary approach and is working to achieve this through the NEPSI dialogue. The initiative involves over 40 participants representing industry (including the Electronics Industry Alliance), government (including Massachusetts' Product Stewardship Institute, described in "Government Action on End-of-Life Electronics" in this chapter), nongovernmental organizations (including INFORM), and academia. (See Appendix E for a complete list of participants and their affiliations.)

NEPSI is focusing on computer equipment and TVs and is addressing such questions as:

- What mechanisms (such as advance disposal fees) can be used to pay the end-of-life management costs of these products?
- Who should pay the costs of collection, transport, and recycling?
- What collection, transport, and recycling infrastructure is required?
- What regulatory changes are needed (e.g., to remove barriers to recycling)?

NEPSI plans to hold six meetings ending in September 2002. Ideally, the end result will include a consensus on what responsibility industry should have for managing electronic equipment at end of life. If this effort fails, more initiatives can be expected at the state level to require manufacturers to pay the end-of-life management costs for these products.

Government Action on End-of-Life Electronics

No legislation dealing with end-of-life electronics has so far been passed at the federal level in the US. However, there have been numerous initiatives at the state and local levels. This is not surprising, since it is here that government is struggling with the financial burden of managing the fast-growing and toxic electronics waste stream.

Minnesota

The state that has taken the lead in promoting product stewardship and EPR is Minnesota. In 1991, Minnesota adopted legislation making the producers of nickel-cadmium batteries responsible for collecting and responsibly managing them at end of life. This, along with action in several other states, ultimately led to a national take-back and recycling program for these batteries that is fully funded by industry (see chapter 6 for a discussion of this program).

More recently, the Minnesota Office of Environmental Assistance (OEA) launched its Product Stewardship Initiative in 1999, resulting in the creation of multi-stakeholder task forces to address three priority waste streams: paint, carpet, and electronic products with cathode-ray tubes (CRTs). Progress made by these task forces and the pilot projects they spawned led to many of the voluntary electronic take-back programs that exist today, and also to the National Electronics Product Stewardship Initiative described above.

Minnesota includes in its definition of product stewardship the shifting of the responsibility and costs of managing end-of-life products from the general taxpayer to the manufacturer and consumer, causing those costs to be internalized in product prices. The three goals of the Product Stewardship Initiative are:

1. Reducing or eliminating the toxic and/or hazardous constituents of products.
2. Using materials, water, and energy efficiently.
3. Promoting the sustainable use of materials by increasing reuse, recycling, and recovery.

The OEA states that “when manufacturers share the costs of recycling products, they have an incentive to use recycled materials in new products and to design products to be less toxic and easier to recycle, incorporating environmental concerns into the earliest phases of product design.”³⁷

In addition to the Product Stewardship Initiative, Minnesota conducted, between 1999 and 2000, a Demonstration Project for Recycling Used Electronics, which aimed to acquire data on collection systems, recycling markets, costs, and barriers. Partnering with the OEA were Sony Electronics, Panasonic-Matsushita, Waste Management Inc.-Asset Recovery Group, and the American Plastics Council, each of which pledged a minimum of \$25,000 to the initiative. Minnesota described the demonstration project as “the first large-scale multi-stakeholder effort in North America to divert used electronic products from municipal waste.”³⁸ In addition to the primary partners, industry participants included retailers such as Computer World and Circuit City, which held collection events at their stores.

The project addressed all electronic and electrical products, with the exception of white goods, air conditioners, and microwave ovens, for which a collection structure already exists in Minnesota. Over a three-month period in 1999, the demonstration project collected 575 tons of used electronics at 64 sites. An important finding was that collection and transport accounted for over 80 percent of the costs of managing these products at end of life. Data from the project also indicated a need for reductions in the number of times products are handled (to reduce costs), better recycling technologies, increased use of recycled content (to spur market development), and regulatory relief.³⁹

This demonstration project was pivotal in Sony's and Panasonic's decision to develop programs for recycling their own products in other states. Best Buy's take-back initiative also had its roots in Minnesota, where it joined Panasonic and Sharp in a collection event.

Massachusetts

In 2000, the Massachusetts Executive Office of Environmental Affairs and the University of Massachusetts created the Product Stewardship Institute (PSI) "to assist state and local government agencies in establishing cooperative agreements with industry and developing other initiatives that reduce the health and environmental impacts from consumer products."⁴⁰ PSI comprises 17 state governments, 11 local members, and the Northeast Waste Management Officials Association, which represents six states. (See Appendix F for a complete list of members.)

According to PSI's definition of product stewardship, it includes manufacturers taking increasing responsibility for the end-of-life management of their products. Its objectives — like those of EPR — are "to encourage manufacturers to redesign products with fewer toxics, and to make them more durable, reusable, and recyclable, and with recycled materials."⁴¹ PSI has targeted five waste streams: electronics, mercury-containing products, pesticides, paint, and carpet. So far, a major focus has been on electronics.

In 2000, Massachusetts banned the landfilling and incineration of CRTs. At the same time, the state awarded grants to municipalities to set up collection programs and find markets for recycled materials that would ultimately enable the programs to be self-supporting.

This goal has not been accomplished, so additional legislation is now being proposed to prohibit manufacturers from selling products that contain CRTs in Massachusetts unless they have a state-approved plan for managing these products at end of life. Such a plan would include a convenient and accessible collection system that recovers 95 percent of the used equipment. Costs would be borne by the manufacturer and could be included in the product price; customers using the collection system could not be charged a fee.⁴² State Representative Mark J. Carron, who is sponsoring the legislation, believes it provides the best chance for these materials to be recovered and reused.⁴³

A resolution circulating in Massachusetts (see Appendix G) calls for the state legislature to support the Carron CRT take-back bill and develop additional legislation requiring producer take-back of all consumer electronics and hazardous household products. It also calls for the adoption of statewide procurement guidelines requiring vendors of such products to state and local government to take them back at end of life. The resolution argues that "the costs incurred by Massachusetts cities and towns for disposal of products that contain toxics and are not easily recyclable, particularly electronic products and household hazardous products, are in effect unfunded mandates imposed by the producers of such products on local taxpayers; which takes funds away from other needed local government programs, such as schools, fire protection, emergency services, and police."⁴⁴ As of

March 2002, 54 cities and towns in Massachusetts, including Boston, had adopted the resolution and others may do so in the future.⁴⁵

California

In California, the Department of Toxic Substance Control has ruled that CRTs are hazardous waste and cannot be disposed of in landfills or burned in incinerators. Waste managers are now scrambling to find alternative methods of dealing with this waste.

In July 2001, the Board of Supervisors of the city and county of San Francisco adopted a resolution urging statewide implementation of EPR for electronics. The resolution, which is similar to the one circulating in Massachusetts, states that the burden of responsibility for electronic products should be shifted from government and taxpayers to the manufacturers, distributors, and consumers of these products. It urges the state to pass legislation requiring industry to create a program resulting in high recovery rates — one that includes convenient collection systems and incentives for consumers to dispose of end-of-life electronic products properly. If an effective program is not created by industry or enacted by the California legislature by October 15, 2002, San Francisco threatens to take action itself, including the possibility of imposing deposits or fees on electronic equipment at the point of sale.

Similar resolutions have been adopted in other California cities including Los Angeles, San Jose, and Sacramento. These initiatives are being coordinated by four nonprofit organizations — Californians Against Waste, Materials for the Future, Green Capitol, and the Silicon Valley Toxics Coalition. The latter has also undertaken a national Take It Back Campaign that is putting pressure on industry to initiate computer take-back and recycling programs, and on state and local legislatures to require such programs if industry fails to implement them effectively.

Advance Disposal Fees and Landfill Bans

Advance disposal fees are included in the product price paid by consumers. They are based on a product's end-of-life management costs and are used to pay some or all of those costs.

Two states, South Carolina and Arkansas, recently considered legislation that included advance disposal fees to fund the recycling of end-of-life electronic equipment. In South Carolina, the legislation died because of the proposed \$5.00 fee on TVs and computer monitors. In Arkansas, the legislation passed but the actual fee was rejected.⁴⁶ In both cases, failure of the fees was due to their being perceived as an additional tax.

The part of the Arkansas legislation that did become law instructs state agencies to sell their surplus electronic equipment, with 25 percent of the proceeds to provide revenues for a new computer and electronic recycling fund. The legislation also authorizes the state to impose a ban on the landfilling of computers and electronic equipment, but not before January 1, 2005.⁴⁷

Landfill bans on electronic equipment are under consideration in a number of states, including Connecticut, Florida, Iowa, and New Jersey.⁴⁸ As already noted, Massachusetts banned the landfilling of CRTs in 2000.

Other Local Initiatives

In Texas, the city of Houston is working with Waste Management Inc. (WMI) on an electronics recycling pilot project. A broad range of products is accepted, including cell phones (without batteries) and small consumer

electronics such as personal digital assistants (e.g., Palm Pilots) and pagers. The equipment is disassembled in Texas, with half the materials then being sent to recyclers in North America and the remainder to markets in Europe and Asia. WMI pays Houston 5 cents per pound for the cell phones and central processing units it provides, while the city pays WMI 25 cents per pound to take computer monitors and 27 cents per pound to take TVs.⁴⁹ This arrangement suggests that the economics of managing cell phones are much more favorable than the economics of recycling equipment with CRTs.

In the western part of the US, state and local governments in California, Oregon, and Washington, along with some nongovernmental organizations, have formed the Western Electronic Product Stewardship Initiative (WEPSI) to address management of used electronic equipment. The group is working toward a “shared responsibility” framework and plans to produce a product stewardship workbook to help implement its strategy on the West Coast.



The efforts described in this chapter to address the end-of-life management of electronics in the US represent an important step forward. Traditionally, electronic products have been thrown out in the trash and their end-of-life management has been solely the responsibility of municipal government. The emerging programs indicate that producers are beginning to acknowledge some responsibility for their products after consumers discard them. So far, however, these initiatives have been small in scale and in no way comparable to what will soon be required in Europe (see chapter 5).