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Managing Electronic Waste: An Analysis of State E-Waste Legislation

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Summary

Pursuant to the Resource Conservation and Recovery Act (RCRA), the U.S. Environmental Protection Agency (EPA) has established regulations regarding the disposal of hazardous wastes. Although there are federal requirements under RCRA for the management of hazardous waste, some states have opted to implement *more* stringent requirements — particularly with regard to the management of certain hazardous wastes generated by households and small businesses (entities that are essentially exempt from RCRA's hazardous waste management requirements).

One category of household hazardous waste that many states are choosing to regulate more strictly is electronic waste, commonly referred to as "e-waste." E-waste generally refers to obsolete, broken, or irreparable electronic equipment like televisions, computers and computer monitors, laptops, printers, cell phones, copiers, fax machines, stereos, or video gaming systems. Cathode ray tubes (CRTs) in televisions and computer monitors have presented a particular concern to states, primarily due to the potentially significant amounts of lead they contain and the large numbers in which they are generated.

State concerns specific to the landfill disposal or incineration of e-waste are largely due to its increasing volume and often bulky nature; hazardous constituents, such as lead and mercury, it may contain; its high cost of recycling; and the inability of interested stakeholders, such as electronics retailers and manufacturers, to reach consensus on how to voluntarily implement a national e-waste management system. States have responded to this concern by enacting their own e-waste management laws. Requirements of those laws range from a ban only on the landfill disposal or incineration of designated e-wastes to the implementation of a full e-waste collection, transportation, and recycling system.

To date, 12 states have enacted some form of e-waste management law (as many as 20 states proposed e-waste laws in 2006 and 2007). Although the goal of each law is similar — to avoid landfill disposal and incineration of certain types of e-waste — approaches taken to achieve that goal differ significantly. However, most state laws and proposals have certain broad elements in common, such as specifying the electronic devices covered under the law; how a collection and recycling program will be financed; collection and recycling criteria that must be met to minimize the impact to human health and the environment; and restrictions or requirements that products must meet to be sold in the state.

As more states propose e-waste legislation, potentially regulated stakeholders (particularly electronics manufacturers and retailers) have expressed concern that they will be required to comply with a patchwork of state requirements throughout the United States. This concern has led to an increased call for federal legislation regarding e-waste management. To help policy makers better understand the impact of state e-waste legislation, this report discusses issues that have led to state action, common elements in state-waste laws and proposals, and an overview of each enacted state law.

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Introduction

Pursuant to the Resource Conservation and Recovery Act (RCRA),[1] the U.S. Environmental Protection Agency (EPA) has established regulations regarding the transport, treatment, storage, and disposal of hazardous wastes. RCRA establishes certain minimum standards that states must meet. However, states have the option to implement requirements that are *more* stringent than those specified under RCRA. Many states have opted to do so — particularly with regard to the management of certain hazardous wastes generated by households.

Households and certain small businesses are essentially exempt from RCRA.[2] This means that under federal law, hazardous wastes generated by those entities may be disposed of in municipal solid waste landfills or incinerators. One category of household hazardous waste that many states are choosing to regulate more strictly is electronic waste, commonly referred to as "e-waste."

There is no universally accepted definition of e-waste, but it generally refers to obsolete, broken, or irreparable electronic equipment such as televisions, computers and computer monitors, laptops, printers, cell phones, VCRs, DVD players, copiers, fax machines, stereos, and video gaming systems. State and local agencies, particularly municipal waste management agencies, have become increasingly concerned about the landfill disposal or incineration of e-waste because of the large volumes in which it is being generated and because of the hazardous constituents the waste may contain.

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[1] The Solid Waste Disposal Act (SWDA), enacted by Congress in 1965, provided federal statutory provisions regarding solid waste disposal practices. RCRA was a 1976 amendment to SWDA. All subsequent amendments to SWDA, including the Hazardous and Solid Waste Amendments (HSWA, P.L. 98-616) of 1984 and the Federal Facilities Compliance Act (FFCA, P.L. 102-386) of 1992, are commonly referred to as RCRA.

[2] Under RCRA, hazardous waste generators are regulated in accordance with the amount of waste they generate each month. EPA regulations specify three hazardous waste generator categories: large quantity generators (LQG, generators of more the 1,000 kilograms of hazardous waste per month), small quantity generators (SQG, generators of between 100 and 1,000 kilograms of hazardous waste per month), and conditionally exempt small quantity generators (CESQGs, generators of less than 100 kilograms of hazardous waste per month). CESQGs are largely exempt from RCRA's hazardous waste management requirements, but may have some recordkeeping or reporting requirements. Also, a CESQG may be subject to more stringent requirements established by the state.

To avoid landfill disposal or incineration, e-waste may be recycled. Recycling may include any of a number of services or processes, such as: sorting to find reusable devices (which may in turn be sold or donated to an entity such as a school or charitable organization); demanufacturing into component parts that can be resold; or further processing components to extract materials such as metals, glass, or plastic.[3] For example, leaded glass in a cathode ray tube (CRT) may be recovered and reprocessed to produce new CRTs. Recycling can be a costly process (see "The Cost of Recycling Electronics," below). A challenge to many states is how to finance an e-waste collection and recycling program.

To date, 12 states have enacted some form of legislation or regulations that will affect e-waste recycling and disposal practices. As more states propose such legislation, potentially regulated stakeholders (particularly electronics manufacturers and retailers) have expressed concern that they will be required to comply with a patchwork of state requirements throughout the United States.

In 2005, two congressional hearings were held to explore issues associated with e-waste, and the Congressional E-Waste Working Group was formed. One goal common to both the hearings and the establishment of the working group was to explore potential national solutions to the e-waste management issue. With increased legislative activity in the states, it is anticipated that stakeholders will increase their call for federal legislation regarding e-waste management. To illustrate the issues associated with individual state action, this report discusses the key issues that have led to state action, describes common elements in state waste laws and proposals, and provides an overview of each enacted state law.

Issues Leading to State Action

The Volume and Bulky Nature of E-Waste

The proliferation of and increasingly rapid technological advances in electronics means that the volume of e-waste generated in the United States is large and growing. Until recently, data regarding electronic products sold, stored, recycled, disposed of, and exported in the United States were limited. In 2007, EPA completed a study that attempted to gather more data.[4] According to that study, as of 2005, of electronic products sold in the United States between 1980 and 2004,

- almost half (976 million units) were still in use or reuse,

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[3] For more information, see the International Association of Electronics Recyclers "About Electronics Recycling," Web page at [http://www.iaer.org/aboutrecycling.htm].

[4] In April 2007, EPA published the results of its study on "Electronics Waste Management in the United States." The electronic products covered in EPA's analysis are televisions, personal computers (desktops, laptops, and computer monitors), hard copy computer peripherals (including printers, scanners, and fax machines), computer mice, keyboards, and cell phones. EPA used two different approaches to gather its data; the results from each approach are available at [http://www.epa.gov/epaoswer/hazwaste/recycle/ecycling/manage.htm].

- almost 42% (842 million units) were recycled or disposed of, and
- almost 9% (180 million units) were in storage.

Further, in 2005 alone, EPA estimated that between 1.9 to 2.2 million tons of electronics became obsolete. Of that amount, between 1.5 to 1.9 million tons were discarded, primarily in landfills. Although EPA estimates that e-waste comprises about 2% of the municipal solid waste stream, it is anticipated that this percentage will grow as consumers continue to replace old and outdated electronic equipment and discard equipment in storage. This will be the case particularly after the transition from analog to digital television broadcasts [5] and with the increased use of flat-screen televisions and computer monitors.

In addition to the bulky nature of electronic devices such as televisions and computers, the increasing volume of e-waste concerns some states, particularly state and municipal waste management agencies. Because these items have the potential to be reused or recycled, some states have become increasingly interested in diverting such waste from municipal landfills.

Hazardous Components in E-Waste

The potential presence of various toxic or hazardous components is another reason that e-waste is a concern. For example, cathode ray tubes (CRTs),[6] computer central processing units (CPUs), and other electronic devices generally contain significant quantities of lead.[7] CRTs contain an average of four pounds of lead but may contain more, depending on the size, age, and make of the device. Electronic devices are also likely to contain a number of other heavy metals, such as mercury, beryllium, barium, chromium, nickel, or zinc.[8] Also, brominated flame retardants are commonly added to the plastic housing of televisions, computers, and other

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[5] Under the Deficit Reduction Act of 2005 (P.L. 109-171), Congress established a deadline of February 17, 2009 for the transition from analog to digital television. (For more information, see CRS Report RL31260, *Digital Television: An Overview*, by Lennard Kruger.) During this transition, it is anticipated that many consumers will choose to buy new digital televisions, potentially adding to the e-waste waste stream as old televisions are discarded.

[6] CRTs are the vacuum tubes that make up the video display components of televisions and computer monitors.

[7] Lead is a toxic metal that can cause delayed neurological development in children and other adverse health effects in adults, including increased blood pressure, nephritis, and cerebro-vascular disease. For more information, see EPA's Final Rule, "Hazardous Waste Management System; Modification of the Hazardous Waste Program; Cathode Ray Tubes," 71 *Fed. Reg.* 42927 July 28, 2006.

[8] *E-waste: Swiss E-waste Guid*e, "Hazardous Substances," May 31, 2006, available at [http://ewasteguide.info/hazardous_substances].

electronic devices.[9] When disposed of in landfills or incinerated, hazardous components of e-wastes may be released into the groundwater or air.[10]

In some instances, hazardous materials are used in electronics to make those devices safe for consumer use or because less toxic alternatives are not readily available. For example, CRT glass is infused with lead to protect users from radiation emitted from the tube; flame retardants are added to plastics to prevent the heated electronic devices from catching fire. Although flat panel monitors are replacing CRTs, those monitors often need mercury to operate efficiently. The continued use of certain hazardous substances makes the need for recycling options greater, if the goal is to minimize the disposal of those substances in a landfill or incinerator.

The Cost of Recycling Electronics

There are various elements that contribute to the cost of a state recycling program. The recycling infrastructure itself includes the cost of collecting, transporting, and sorting the devices. There is also a cost associated with recycling the devices themselves. Recyclers and refurbishers often charge a fee for their services because their costs outweigh the revenue received from recycled commodities (e.g., glass, metals, or reusable components) or from the sale of refurbished units. Although they will recover a certain amount of usable scrap from e-waste, they will also likely incur expenses when they have to handle and dispose of any hazardous components. Also, unlike household consumers, recyclers will be regulated under RCRA and are subject to the more stringent requirements applicable to hazardous waste storage, transportation, and disposal.

Some stakeholders argue that one method of lowering the cost of processing electronics is to improve economies of scale through increased volume. Until recently, the primary sources of electronic devices for recycling have been

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[9] Polybrominated diphenyl ethers (PBDEs) are the most commonly used brominated flame retardants (BFRs) that became a replacement for polychlorinated biphenyls (PCBs). A study conducted in the late 1990s found that levels of PBDEs in samples of human milk had increased exponentially, in contrast to contaminants such as PCBs, since the early 1970s (see The Environment Canada Web page "Brominated Flame Retardants," at [http://www.nwri.ca/research/brf-e.html]). Still, the extent to which PBDEs pose a threat to human health is unclear (see the Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, ToxFAQs™ for PBDEs, available at [http://www.atsdr.cdc.gov/tfacts68-pbde.html]).

[10] Tests designed to simulate landfill conditions have revealed that CRTs and certain other electronic devices exceed regulatory limits for lead leachability. See research by Timothy G. Townsend et al., "Investigation of TCLP Leachability of Leaded CRT Glass," sponsored by the Florida Center for Solid and Hazardous Waste Management, available at [http://www.ees.ufl.edu/homepp/townsend/Research/CRT/default.asp]; and "Leaching of Hazardous Chemicals from Discarded Electronic Devices," sponsored by EPA, Regions 4 and 5, available at [http://www.ees.ufl.edu/homepp/townsend/Research/ElectronicLeaching/default.asp].

manufacturers and large businesses.[11] Redirecting household-generated e-waste, that has typically been disposed of in a landfill or left unused in storage, could provide recyclers with a larger and steadier supply of products to recycle.

According to the Government Accountability Office (GAO), cost and inconvenience inhibit consumers from recycling used electronics.[12] Although some computer manufacturers now accept their own products for recycling free of charge,[13] consumers generally have to pay the manufacturer a fee to recycle their e-waste (by packing and shipping them to the manufacturer themselves) or they must drop off their used electronics at often inconvenient locations (also, often for a fee). If the consumer does not pay for recycling, any recycling fees would likely be absorbed by the state or local agency collecting the device.

Most stakeholders agree that if e-waste is to be recycled, it must be as easy for consumers to recycle electronics as it is to buy them.[14] Many local and state agencies, retailers, and electronics manufacturers have worked with EPA to sponsor pilot programs providing convenient, free recycling services to consumers. The success of those programs demonstrated how successful e-waste recycling programs can be if they are convenient and inexpensive.[15] However, most states do not want to bear the full financial burden of establishing an e-waste management program. One factor driving states to develop e-waste laws is to implement a system that will provide financing for an e-waste collection, transportation, and recycling system.

The Inability of Stakeholders to Agree on a National System

For several years, interested stakeholders have debated how to best address the e-waste management issue. Those stakeholders include electronics manufacturers and retailers, local and state governments (particularly waste management and water treatment agencies), recyclers, environmental organizations, and charitable organizations that accept donation of used electronics. In general, these groups have agreed that the growth of e-waste has outpaced the development of infrastructure to

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[11] The International Association of Electronics Recyclers, "About Electronics Recycling," Web page at [http://www.iaer.org/aboutrecycling.htm].

[12] Statement of John B. Stephenson, Director, Government Accountability Office (GAO) Natural Resources and Environment, before the Subcommittee on Superfund and Waste Management, Committee on Environment and Public Works, U.S. Senate, "Electronic Waste: Observations on the Role of the Federal Government in Encouraging Recycling and Reuse," July 25, 2005, pp. 8-10.

[13] In June 2007, Dell announced that it would recycle any of its products free of charge. For more information, see the "Dell and the Environment" Web page at [http://www.dell.com/content/topics/segtopic.aspx/dell_recycling?c=us&cs=19&l=en&s=dhs].

[14] Department of Commerce, Office of Technology Policy, *Recycling Technology Products: An Overview of E-Waste Policy Issues*, July 2006, p. 20, available at [http://www.technology.gov/reports.htm].

[15] Statement of John B. Stephenson, Director, GAO, "Electronic Waste: Observations on the Role of the Federal Government in Encouraging Recycling and Reuse," pp. 8-10.

appropriately reuse or recycle it. However, those stakeholders have disagreed about the best way to implement a program to manage such waste.

In 2001, a group of stakeholders formed the National Electronics Product Stewardship Initiative (NEPSI). The group's mission was the "development of a system, which includes a viable financing mechanism, to maximize the collection, reuse, and recycling of used electronics, while considering appropriate incentives to design products that facilitate source reduction, reuse and recycling; reduce toxicity; and increase recycled content."[16] Relatively early in the process, NEPSI determined that federal legislation would be required to implement any plan agreed to by the group.[17]

By 2004, the group had reached an impasse on how to finance a nationwide recycling system. That impasse divided the group into two camps — those who believed that a collection and recycling program should be financed through a consumer-paid advance recycling fee (ARF) assessed at the point-of-sale of designated electronic devices, and those who advocated a "producer pays" model wherein electronics manufacturers either took back their own e-waste and recycled it or paid for a system that would. (For more information about these two financing systems, see the section "A Mechanism to Fund the Program," below.)

In the absence of federal e-waste legislation or stakeholder consensus regarding an appropriate national e-waste collection and recycling program, states have begun to implement their own programs. Provisions of each law vary significantly and range from a ban on the landfill disposal of CRTs to implementation of a state-wide e-waste collection and recycling program.

Common Provisions of State E-Waste Laws

Twelve states have enacted some form of e-waste management law. Although the goals of each law are similar — to avoid landfill disposal of certain e-waste — the approaches taken to achieve those goals differ significantly. However, most state laws and proposals have certain broad elements in common, such as specifying the electronic devices covered under the law, how a collection and recycling program will be financed, collection and recycling criteria that must be implemented to minimize impacts on human health and the environment, and restrictions or requirements that products must meet to be lawfully sold in the state.[18]

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[16] See the National Electronics Product Stewardship Initiative Web page at [http://eerc.ra.utk.edu/clean/nepsi/default.htm].

[17] See *Solid Waste Digest*, "E-Waste Brings Together Industry, Activists, And Government — But Is Consensus Near?" November 2002, at [http://www.wasteinfo.com/news/stories/archives/2002/11/NA/N02B11.htm].

[18] Some states have implemented effective voluntary e-waste recycling programs as part of their household hazardous waste management program. Voluntary recycling programs (i.e., those that are not financed by an electronics manufacturer or through the assessment of an (continued...)

Definition of Products Covered by the Law

Each state e-waste management program identifies certain electronic devices covered under the law. Most often, these are referred to as "covered electronic devices" (CEDs). Each state e-waste law defines CEDs slightly differently, but all include cathode ray tubes (CRTs). All state laws apply to CRTs in computer monitors, most also include CRTs in televisions. The laws also apply only to CRTs above a designated screen size — generally greater than four inches measured diagonally. CEDs may also include

- desktop computers — including the central processing unit (CPU);
- flat panel computer monitors or televisions using a plasma display or liquid crystal display (LCD);
- portable computers (laptops);
- combination units (CPUs with monitors);
- peripheral devices, such as keyboards, printers, and other devices sold for external use with a computer;
- facsimile (fax) machines;
- DVD and video cassette players or recorders; and
- cell phones.[19]

Each state law also specifies the types of electronic devices that are *not* regulated under the law, which usually includes video displays that are contained within a motor vehicle or piece of industrial, commercial, or medical equipment, and certain consumer products, such as clothes washers or microwave ovens.

A Mechanism to Fund the Program

In attempting to reach consensus among the various stakeholders, determining "who pays" for e-waste collection and recycling programs has been the most contentious issue. Many potential methods exist for funding an e-waste collection and recycling program.[20] Most current state programs fall into two broad categories: a consumer-paid system or a producer- or manufacturer-paid system.[21]

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[18] (...continued)
advanced recycling fee) are not discussed in this report. However, for information about such a program, see the Florida Department of Environmental Protection's "End-of-Life Electronics" website at [http://www.dep.state.fl.us/waste/categories/electronics/default.htm].

[19] States that have requirements applicable to cell phones generally address that category of e-waste in separate legislation. Cell phone-specific requirements are not discussed in this report.

[20] For a description of additional funding mechanisms, see Department of Commerce, Office of Technology Policy, *Recycling Technology Products: An Overview of E-Waste Policy Issues*, July 2006, p. 83, available at [http://www.technology.gov/reports.htm].

[21] In discussing e-waste management, the terms "producer" and "manufacturer" are used interchangeably with regard to electronics manufacturers.

Under any financing scheme, it must be determined who will pay to manage orphan waste. "Orphan waste" is e-waste for which no manufacturer can be identified or for which the manufacturer is no longer in business. Given the high rate of turnover in the electronics business, the large numbers of foreign manufacturers that may be difficult to track down, and the large numbers of "white box" products (electronic products put together by component assemblers without a brand name affixed to the device), the proportion of orphan waste is potentially substantial. For example, as a part of its e-waste program, Washington State identified more than 1,200 orphan brands of electronics potentially sold or likely to appear in the state's e-waste stream.[22]

The Consumer Pays Model. One method of financing an e-waste collection and recycling program requires consumers to pay an advanced recycling fee (ARF) at the point-of-sale of designated electronics. Proceeds from the ARF would be used to implement the state's e-waste collection infrastructure and recycling programs. The collected funds may be managed by a state commission or a private third-party organization (TPO). Suggested ARFs are generally between $6 and $10, depending on the size of the device. This amount is less than the cost of recycling individual CEDs. However, because more products are sold than enter the waste stream, the cost of establishing a recycling infrastructure may be paid for at less than the per-unit recycling price. A portion of the funds may pay for local collection so that the government does not assume the cost of developing and running the recycling infrastructure. Also, retailers collecting the fee may keep a certain percentage of the fee to cover their administrative costs.

The ARF approach has been adopted in California and is favored by certain electronics manufacturers. Supporters of this system argue, in part, that it would

- immediately and reliably create a sustainable source of funding for a recycling infrastructure;
- pay for recycling all returned products, including orphan waste;
- be simple and could be implemented efficiently; and
- include a fee that is transparent to consumers and may contribute to consumer awareness of the need to recycle.

Stakeholders opposed to this approach argue, in part, that

- it would not be easily applied to Internet sales, presenting a competitive disadvantage to retailers assessing the fee;
- it would not provide manufacturers with an incentive to produce more environmentally benign products or to design products that may be more easily recycled; and
- if the collected funds exceeded recycling costs, those funds could be taken by the state and used for other purposes.

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[22] See the Washington State Department of Ecology, "Washington Recycles: Electronics, Establishing a Return Share List" Web page, under "2009 Return Share Information: Orphan List," at [http://www.ecy.wa.gov/programs/swfa/eproductrecycle/returnShare.html].

The Producer Pays Model. This approach requires manufacturers to implement or finance a collection and recycling program that takes responsibility for their share of returned e-waste and a share of orphan waste (generally assessed based on the company's total market share in the state). This is often referred to as an extended producer responsibility (EPR) or producer-pays approach. Some models allow the producer to address its share of waste by establishing its own recycling program (or one in cooperation with other manufacturers) or paying the state for the collection, consolidation, and recycling costs of its share. To date, all state e-waste programs, except California's, implement some version of the producer-pays model.

Stakeholders in favor of this approach include environmental organizations, retailers, and certain manufacturers that have already established recycling programs for their products. Some of their arguments to support this approach include

- the system places limited responsibilities on retailers and consumers and avoids the creation of new taxes on consumers,
- manufacturers implementing their own recycling programs have the flexibility to design their recycling program as they see fit, and
- making manufacturers responsible for recycling their own products may make them more likely to design products that are easier to recycle or that would have fewer toxic components.

Stakeholders opposed to this approach argue, in part, that

- the allocation of disposal/recycling costs to a given manufacturer would likely require costly sorting to identify the appropriate manufacturer,
- existing manufacturers would be responsible for the cost of recycling orphan waste, and
- the internalization of recycling costs may ultimately cost consumers more than an ARF once the recycling costs are subject to mark-up as the product moves through the distribution process.

Another variation on the producer-pays model involves manufacturers paying a flat fee to sell their products in that state. The collected fees are used to create a grant program for local governments to implement an e-waste recycling program. Maryland is currently the only state with such a program.

Collection and Recycling Criteria

State e-waste programs do not specify *how* e-waste must be collected. That is, they do not specifically require curbside pickup, municipal drop-off centers, retailer collection, or producer-established drop-off centers. However, each state program includes certain provisions regarding e-waste collection and recycling criteria that are intended to protect human health (particularly the health of individuals involved with recycling operations) and the environment.

Ban Landfill Disposal or Incineration. Although the details of state e-waste programs vary, one goal they all share is to reduce landfill disposal or

incineration of e-waste, particularly CRTs. To reach that goal, some states have chosen to ban the disposal of CEDs in municipal solid waste landfills or incinerators.

Several states have implemented only a landfill or incineration ban (i.e., they have established no program to fund a collection and reuse/recycling program). Those states are Arkansas, Massachusetts, New Hampshire, and Rhode Island. In some states, a landfill ban preceded implementation of a full e-waste recycling program (see discussion regarding the California and Minnesota programs, below). In other cases, implementation of an e-waste collection and recycling program is required before a landfill ban takes effect (see discussion regarding the Connecticut program, below).

No state specifically requires consumers to recycle. Therefore, if a landfill ban is in place, the responsibility generally falls solely on the municipal government to collect e-waste and ensure that it is properly managed (i.e., not sent to a municipal landfill).

Restrict E-Waste Exports. According to the Department of Commerce, much e-waste (possibly 50% to 80%) is sent overseas for recycling because it is more costly to recycle in the United States and most consumer electronics manufacturers (who provide the market for materials recovered from recycled electronics) have moved overseas.[23] Also, in states that ban the disposal of CRTs in landfills and incinerators within their borders, e-waste can be recycled, disposed of outside of the state, or exported. If a recycling infrastructure is not present before a disposal ban takes effect, exporting e-waste may be the most likely choice. Even if there are recyclers present in a given state, recyclers manage a significant percentage of the e-waste they receive by exporting it.

Most often the exported e-waste is sent to nations such as China or developing countries of Asia. Environmental organizations and certain other stakeholders are concerned that those countries do not enforce environmentally sound waste management practices or recycle in a manner that would protect workers handling toxic materials.[24] These practices potentially expose vulnerable populations to toxic chemicals, with few, if any, worker protections or a framework to protect the local environment. Some states have responded to these concerns by banning e-waste exports.

Set Recycling Standards. Some state programs address potential environmental concerns by attempting to ensure that the law does not exchange one potentially harmful disposal method (e.g., disposal in a solid waste landfill) for another (e.g., recycling in a manner that may harm employees or the environment). They may do so by directing their state environmental protection agency to develop recycling standards. Those standards generally specify criteria that should be met to ensure that e-waste is recycled in compliance with all applicable environmental,

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[23] The Department of Commerce report, *Recycling Technology Products*, p. 27.

[24] Basel Action Network and Silicon Valley Toxics Coalition, *Exporting Harm: The High Tech Trashing of Asia*, February 25, 2002, available at [http://www.ban.org/E-waste/technotrashfinalcomp.pdf].

health, and safety regulations, and in a manner that protects the environment and the health and safety of workers in the United States and other countries.

Prohibit the Use of Prison Labor. Federal Prison Industries, a government-owned corporation that does business under the trade name UNICOR, runs e-waste recycling programs employing prison laborers. Some stakeholders are opposed to the use of UNICOR. For example, some recyclers have cited unfair competition from UNICOR, which they see as an impediment to creating a competitive recycling market because UNICOR's low labor rates keep prices down.[25] Others cite health and safety problems that have led to inmate workers being exposed to toxic and hazardous components.[26] These concerns have led some states to include a ban on the use of prison labor in their recycling programs.

Product Restrictions

Most state e-waste laws specify some conditions that manufacturers or retailers must meet before a product can be offered for sale in the state.

Labeling Requirements. Most state e-waste programs implemented to date require some entity (e.g., a state agency, e-waste collector, or other third party) to determine the share of collected e-waste that can be attributed to individual manufacturers. In order to more easily identify responsible manufacturers, most state laws specify that a manufacturer may not offer for sale in the state a CED unless it has a visible, permanent label clearly identifying the manufacturer of the device.

Registration Requirements. Most state e-waste programs require electronics manufacturers to register with the state. Generally, states require an initial registration, an annual registration thereafter, and payment of a registration fee. Information required to be included in the registration varies significantly from state to state. States may also require e-waste collectors, transporters, and recyclers to register with the state in order to be paid for their services.

Restrictions on the Use of Certain Materials. Although not common, state e-waste laws may include certain elements of European Union (EU) Directive 2002/95/EC on the restriction on the use of certain hazardous substances in electrical and electronic equipment (EEE).[27] Known commonly as the RoHS Directive, it bans the use of certain heavy metals and brominated flame retardants from EEE. The

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[25] The Department of Commerce report, *Recycling Technology Products*, p. 30.

[26] Center for Environmental Health, Prison Activist Resource Center, Silicon Valley Toxics Coalition, and Computer TakeBack Campaign, *Toxic Sweatshops: How UNICOR Recycling Harms Workers, Communities, the Environment, and the Recycling Industry*, October 2006, available at [http://www.computertakeback.com/docUploads/ToxicSweatshops.pdf].

[27] The definition of "electrical and electronic equipment" covered under the RoHS Directive is substantially broader than any e-waste legislation proposed in the United States. It applies to virtually any device, within ten broad product categories, including "IT and telecommunication equipment," that depends on electric currents or electromagnetic fields to work properly. The Directive is available at [http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf].

RoHS Directive requires that EEE does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ether (PBDE). Exemptions for certain applications of these substances are granted where substitution is not feasible or the potential negative environmental and/or health impacts caused by substitution outweigh the environmental benefits. By July 6, 2006, manufacturers selling electronic equipment in EU member states were required to have made the required substitution for hazardous substances.

Most electronics manufacturers sell to a worldwide market. Since they cannot easily change their production processes to accommodate different markets, it is likely that manufacturers that sell products in the United States will similarly meet the requirements of the RoHS Directive. For those manufacturers that do not, RoHS-like provisions in even a small number of states could have the effect of a nationwide requirement. To date, only California has included RoHS-like provisions in its e-waste law by prohibiting the sale of electronic devices that would be prohibited for sale under the RoHS Directive.

Retailer Restrictions. Some state laws make retailers a party to enforcing the law, in essence, by prohibiting them from selling CEDs that do not meet certain requirements. For example, retailers may be required to sell only those CEDs from manufacturers that are registered with the state or that meet labeling requirements.

Overview of Enacted State Legislation

State e-waste laws are similar in that they intend to facilitate the recycling of certain electronic devices. Although the designated CEDs vary slightly from state to state, all include CRTs from computer monitors. Aside from that similarity, each state's means of achieving its goals is significantly different. Following this overview of enacted state e-waste laws, **Table 1** compares key elements of each program.

Arkansas

On April 9, 2001, the state enacted the Arkansas Computer and Electronic Solid Waste Management Act.[28] The law applies to computer and electronic equipment — defined as a personal computer, computer component, audio player, stereo player, videocassette player, facsimile machine, copy machine, cellular telephone, wireless paging device, video game console, or any electronic item containing an intact or broken CRT. The law authorizes the state's Department of Environmental Quality to establish and implement rules and regulations banning the disposal of all computer and electronic equipment in Arkansas landfills by January 1, 2008 (that deadline was extended from the original date of January 1, 2005).

The law also establishes a program that requires state agencies to develop plans to sell, reuse, recycle, or dispose of surplus computer equipment and electronics; and

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[28] The March 18, 2005 amended version of this law is available online at [http://www.arkleg.state.ar.us/ftproot/acts/2005/public/act970.pdf].

encourages those agencies to donate unsold equipment to Arkansas public schools. A portion of the funds generated from selling surplus electronics must be allocated to a Computer and Electronics Recycling Fund, also established by the law. Among other activities, funds may be used for product market research and development grants to determine the most efficient means of collecting, transporting, and processing scrap electronic equipment, and to establish statewide contracts for computer and electronics recycling and demanufacturing businesses.

California

California's Electronic Waste Recycling Act of 2003 was enacted on September 24, 2003, and subsequently amended September 29, 2004.[29] The law applies to new or refurbished televisions or computer monitors that use a CRT or liquid crystal display (LCD), laptop computers, or any other video display device larger than four inches.

Beginning January 1, 2005, the law requires that at the time of retail sale, California consumers must pay an "electronic waste recycling fee" ranging from $6 to $10, depending on screen size. No recycling fee is assessed on the resale or reuse of a covered device. Retailers are required to transfer the collected fees to the Board of Equalization, which in turn deposits the money into an account managed by the California Integrated Waste Management Board (CIWMB). The CIWMB distributes the funds from this account to approved recyclers or to registered manufacturers that are collecting and recycling CEDs.

Following are additional requirements of California's e-waste program:

- A new or refurbished CED cannot be sold without a clearly visible label showing the name of the manufacturer or the manufacturer's brand.
- CED wastes cannot be exported to a foreign country without proper notification to the state Department of Toxic Substances Control.
- The sale of electronic devices that would be prohibited for sale under the RoHS Directive would be prohibited for sale in the state.
- State agencies purchasing or leasing covered electronic devices must require prospective bidders to certify that they comply with the law.

A ban on the landfill disposal of CRTs went into effect under regulations issued by the state in 2001.

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[29] See the California Integrated Waste Management Board Web page "Electronic Product Management: Statutes, Regulations, and Related Issues," at [http://www.ciwmb.ca.gov/Electronics/RegIssues/].

Connecticut

On July 6, 2007, Connecticut enacted its e-waste recycling law,[30] which applies to desktop or personal computers, computer monitors, portable computers, CRT-based televisions and non-CRT-based televisions or any other similar or peripheral electronic device. Under this law, by January 2009, manufacturers will be required to participate in a program to implement and finance the collection, transportation, and recycling of certain electronic devices. The law requires manufacturers to register with the state Department of Environmental Protection and pay an annual fee that the state will use to administer the recycling program.

Also by January 2009, municipalities must provide for the collection of CEDs; waste CEDs must then be transported to and recycled by an approved recycler. In addition to the registration fee, manufacturers must pay reasonable costs of transportation and recycling CEDs attributed to them, and will be billed a pro rata market share for orphan devices.

Following are additional elements of Connecticut's e-waste program:

- By January 1, 2008, a manufacturer or retailer cannot sell a CED in the state unless it has permanently affixed, readily visible label with the manufacturer's brand.
- To be eligible to receive funds from the state, CED collectors, transporters, and recyclers must meet performance standards established by the state.
- Retailers must provide consumers with information on recycling.
- By January 1, 2009, CEDs collected through any state program can not be exported for disposal in a manner that poses a significant risk to the public health or to the environment.
- A landfill disposal ban will take effect in January 2011.

Maine

On April 22, 2004, Maine enacted the Act to Protect Public Health and the Environment by Providing for a System of Shared Responsibility for the Safe Collection and Recycling of Electronic Waste.[31] The law applies to waste televisions and computer monitors (CRTs and flat panel displays or similar video display devices with a screen greater than four inches measured diagonally).[32] The law implements a version of the producer-pays model that requires manufacturers to pay for the handling, transportation, and recycling of televisions and computer monitors.

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[30] See the Connecticut General Assembly Web page at [http://www.cga.ct.gov/2007/ACT/PA/2007PA-00189-R00HB-07249-PA.htm].

[31] See the Maine Department of Environmental Protection "E-waste" Web page at [http://www.maine.gov/dep/rwm/ewaste/index.htm].

[32] CEDs also include computer central processing units (CPUs) that contain one or more circuit boards, but only for labeling purposes (i.e., CPUs are not included in the collection and recycling program). Therefore, discussion of CEDs in the section of this report regarding Maine refers only to waste televisions and computer monitors.

By July 20, 2006, municipalities were required to ensure that waste televisions and computer monitors generated by households are recycled. They are required to ensure that a system is in place for delivering residential waste televisions and computer monitors to a consolidation facility in Maine. Each municipality may determine how this requirement will be met (e.g., operate an ongoing collection center, have one-day collections, or have residents deliver directly to a nearby consolidator).

Beginning January 1, 2006, consolidation facilities were responsible for counting each household-generated waste television and computer monitor and determining the total from each manufacturer. By March 1 of each year, beginning in 2007, the consolidator must provide this accounting to the state Department of Environmental Protection and submit a bill to manufacturers for allowable costs associated with recycling (i.e., the costs of handling, transportation, and recycling of their own television and computer monitor products, plus a pro rata share of orphan products). The consolidator must also transport waste televisions and computer monitors to a certified recycling and dismantling facility.

Following are additional elements of Maine's e-waste program:

- All CEDs offered for sale in the state must have a visible, permanently affixed label clearly identifying the manufacturer of the device.
- Retailers are prohibited from selling any CED offered for sale by a manufacturer not in compliance with the law.
- Recyclers must provide consolidators with a sworn statement that their operations meet environmentally sound management guidelines established by the state.

A ban on the landfill disposal of mercury-added products and CRTs went into effect under separate law on July 20, 2006.

Maryland

The law implementing Maryland's Electronic Recycling Program took effect on July 1, 2005, and was subsequently amended with changes that take effect October 1, 2007.[33] The law, implemented as a pilot program scheduled to end December 31, 2010, applies to manufacturers of computer or video display devices (CRT, LCD, plasma, digital, or other image-projection technology) with a screen greater than four inches.

To sell CEDs in Maryland, manufacturers of more than 1,000 devices a year must register with the Maryland Department of the Environment and pay a $10,000 registration fee (before the amendment, the fee was $5,000). In subsequent years, manufacturers must pay a $5,000 annual fee. Manufacturers with an approved takeback program pay an annual fee of $500. The fees are deposited in a fund to

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[33] See the Maryland Department of the Environment's "eCycling in MD" Web page at [http://www.mde.state.md.us/Programs/LandPrograms/Recycling/SpecialProjects/ecycling.asp].

make grants to counties and municipalities to implement local recycling plans and address methods for the separate collection and recycling of CEDs.

Following are additional elements of Maryland's e-waste program:

- All CEDs offered for sale in the state must be labeled with the name of the manufacturer name or the manufacturer's brand label.
- Retailers are prohibited from selling any CED offered for sale by a manufacturer not registered with the state.
- The law specifies criteria a manufacturer must meet to demonstrate that it has implemented its own takeback program.

Massachusetts

A ban on the landfill disposal of CRTs from television and computer monitors has been in effect since April 1, 2000.[34] The law makes it illegal for a person to dispose of, or for a landfill, incinerator, or transfer station to accept, CRTs for disposal. As part of its electronics recycling strategy, the state has established a grant program providing free electronics recycling for municipalities.

Minnesota

On May 8, 2007, Minnesota enacted its e-waste recycling law,[35] which applies to computers, peripherals (keyboards, printers, or other devices sold for external use with a computer), facsimile machines, DVD players, video cassette recorders, and "video display devices" — defined as a television or computer monitor, including laptops, with a CRT or a flat panel screen that is larger than nine inches.

Beginning July 1, 2007, the law requires manufacturers to register with the state and pay an initial registration fee of either $5,000 (those that sell more than 100 units per year in the state) or $1,250 (those that sell under 100 units). Thereafter, manufacturers must pay $2,500, plus a variable recycling fee based on the total weight of CEDs sold in the previous year. In addition to the registration fee, manufacturers must pay for collection and recycling of their e-waste.

The law also requires manufacturers to meet specific recycling goals (Minnesota is the only state to set such mandatory goals). During the first program year (July 1, 2007 through June 30, 2008), manufacturers must collect and recycle an amount equal to 60% of the total weight of CEDs sold in the state in the previous year; this amount increases to 80% in subsequent program years. Starting August 1, 2008, to assist manufacturers in determining the total weight of CEDs sold in the state, retailers are required to report to manufacturers the number and type of video display devices sold to households in Minnesota during the program year.

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[34] See the Massachusetts Department of Environmental Protection "Computer Monitor & TV Recycling Options for Residents & Small Businesses" Web page at [http://www.mass.gov/dep/recycle/reduce/crtrsbz.htm].

[35] See the Minnesota Pollution Control Agency's "Minnesota's Electronics Recycling Law" Web page at [http://www.pca.state.mn.us/oea/stewardship/electronics-law.cfm].

Following are additional elements of Minnesota's e-waste program:

- All CEDs offered for sale in the state must be labeled with the manufacturer's name or brand label.
- Retailers are prohibited from selling any CED offered for sale by a manufacturer not registered with the state.
- In addition to manufacturers, CED recyclers and collectors must also register with the state (but pay no fee).
- By September 2008, manufacturers' annual registration must include a report on any CEDs they sell that do not meet RoHS requirements.
- Recyclers are prohibited from using prison labor.

A ban on the landfill disposal of CRTs went into effect under separate law on July 1, 2006.[36]

New Hampshire

On May 24, 2006, New Hampshire enacted a ban on the landfill disposal and incineration of "video display devices."[37] Video display devices are defined as a "visual display component of a television or a computer, whether separate or integrated with a computer central processing unit, and includes a cathode ray tube, liquid crystal display, gas plasma, digital light processing, or other image projection technology, greater than four inches when measured diagonally, and its case, interior wires, and circuitry." The ban took effect July 1, 2007.

Oregon

On June 7, 2007, Oregon passed its e-waste recycling law,[38] which applies to televisions and computer monitors of any type with screens larger than four inches, and to desktop or portable computers. By January 1, 2009, manufacturers that sell these products in the state will be required to finance "free, convenient, and environmentally sound" recycling services. Manufacturers can create their own take-back program or participate in a common program, but they must pay for collection, transportation, and recycling costs.

Manufacturers must also register with the state and pay an annual registration fee of $20, $200, $5,000, or $15,000, depending upon their market share in the state. The registration must include a list of products sold in the state and a statement regarding whether the manufacturer will implement its own recycling program in accordance with criteria established by the law, or use the state contractor program.

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[36] For information about Minnesota's CRT landfill ban, see [http://www.pca.state.mn.us/oea/stewardship/crt-ban.cfm].

[37] See the New Hampshire General Court Web page at [http://www.gencourt.state.nh.us/legislation/2006/HB1455.html].

[38] See the Oregon Department of Environmental Quality "Electronics (E-Waste) Recycling Program" Web page at [http://www.deq.state.or.us/lq/electronics.htm].

Among other requirements, the state Department of Environmental Quality will be responsible for maintaining a list of registered manufacturers and orphan brands; determining each manufacturer's return share of CEDs; establishing a state contractor program to collect, transport, and recycle CEDs; and determining the recycling fee to be paid by each registered manufacturer. State and local governments will fund consumer education and promotion of the law. At the time of sale, retailers will be required to provide consumers with information about where and how they can recycle CEDs in the state.

Following are additional elements of Oregon's e-waste program:

- A manufacturer may not sell any CED in the state unless it is labeled with its brand.
- A retailer may not sell any CED unless it is properly labeled and is on the list of registered manufacturers posted by the state.
- A ban on the landfill disposal of CEDs becomes effective January 1, 2010; the state Department of Environmental Quality may postpone the prohibition in any area of the state where there is an inadequate system for CED collection, transportation, and recycling.

Rhode Island

On July 7, 2006, Rhode Island enacted the Electronic Waste Prevention, Reuse and Recycling Act.[39] The law bans the landfill disposal of desktop computers (including CPUs), computer monitors, including CRT monitors and flat panel monitors, laptops, combination units (CPUs with monitors), CRT- and non-CRT-based televisions (including plasma and LCD), or any similar video display device with a screen greater than four inches diagonally and that contains a circuit board. The law specifies that after July 1, 2008, no person shall dispose of a CED in any manner other than by recycling or disposal as hazardous waste.

The law also requires the state Department of Environmental Management, in consultation with stakeholders, to develop a plan for implementing and financing a program that addresses the collection, recycling, and reuse of covered electronic products from all covered electronic product generators in the state. Progress reports on the study were due to the general assembly on January 1 and May 1, 2007. By December 31, 2007, the law also requires the department to submit to the general assembly a plan and recommendations for any legislation necessary to implement the plan for collection, recycling, and reuse of CEDs.

Texas

On June 15, 2007, Texas enacted its e-waste recycling law,[40] which applies to computer equipment — defined as desktop or notebook computers, including

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[39] See the State of Rhode Island General Assembly Web page at [http://www.rilin.state.ri.us/publiclaws/law06/law06365.htm].

[40] See the Texas Legislature Web page at [http://www.capitol.state.tx.us/tlodocs/80R/billtext/html/HB02714F.htm].

computer monitors or other display devices that do not contain a tuner (i.e., it does *not* include televisions). The law requires manufacturers to implement a recovery plan that provides consumers with a free and convenient program to recycle the manufacturer's computer equipment.

Following are additional elements of Texas's e-waste program:

- A manufacturer may not sell any CED in the state unless it is labeled with its brand.
- Retailers may not sell any CED unless it is properly labeled and is on the list of registered manufacturers maintained by the state.
- The Texas Commission on Environmental Quality (the Commission) is required to adopt standards for recycling such as those provided by the Institute of Scrap Recycling Industries, Inc. (which bans the use of prison labor).
- The Commission is required to educate the public regarding the computer recycling programs, maintain program information on a website, enforce requirements for recycling computer equipment, and compile and issue an annual electronic report to the state legislature.

Washington

On November 11, 2006, Washington passed its e-waste recycling law,[41] which applies to CRTs or flat panel computer monitors or televisions with a screen size of more than four inches, and to desktop or laptop computers. The law requires CED manufacturers to finance and implement a program to collect, transport, and recycle waste CEDs. The program must be implemented in accordance with requirements specified in a "Standard Plan," implemented by the state, that will apply to all manufacturers. Individual manufacturers may opt to implement their own "Independent Plan," if it is approved by the Washington Department of Ecology.

By January 1, 2007, and annually thereafter, manufacturers must register with the state and pay an annual administrative fee. By January 1, 2008, and annually thereafter, manufacturers must pay their apportioned costs associated with the implementation of the Standard Plan.

Initially, there is no provision to address financing orphan waste. However, by April 1, 2010, the state's Department of Ecology must report to the state legislature regarding the amount of orphan products collected. If more than 10% of the total products collected are orphan products, the department must provide recommendations for reducing the amount of orphan products or alternative methods for financing the collection, transportation, and recycling of orphan products.

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[41] See the Washington State Department of Ecology, "Washington Recycles: Electronics, Establishing a Return Share List" Web page at [http://www.ecy.wa.gov/programs/swfa/eproductrecycle/index.html].

Following are additional elements of Washington's e-waste program:

- A manufacturer may not sell any CED in the state unless it is labeled with its brand.
- The state is required to establish performance standards for environmentally sound management of CED processors, including financial assurances to ensure proper closure of a facility that is consistent with specified environmental standards.
- Retailers must provide information to consumers describing where and how to recycle CEDs and locations for collection or return of products.
- Each collector, transporter, and recycler of CEDs must annually register with the state.
- No plan or program may include the use of federal or state prison labor for CED processing.

Table 1. Comparison of Selected Elements of State E-Waste Laws

Legislative Element	AR	CA	CT	ME	MD	MA	MN	NH	OR	RI	TX	WA
Funding Mechanism												
ARF		✓										
Producer pays			✓	✓			✓		✓		✓	✓
Flat fee					✓							
Collection & Recycling Standards or Restrictions												
Landfill ban	✓	✓	✓	✓		✓	✓	✓	✓	✓		
Export restrictions		✓	✓									
Ban on prison labor							✓				✓	✓
Recycling standards			✓	✓							✓	✓
Mandatory recycling goals							✓					
Product Requirements or Restrictions												
Product label to identify manufacturer or brand		✓	✓	✓	✓		✓		✓		✓	✓
Provisions tied to the RoHS Directive regarding the use of certain hazardous substances		✓					✓					

Source: Table created by the Congressional Research Service (CRS), based on a review of state e-waste laws. See text for explanation of terms.