Designing an Effective Electronics Recycling Program: Lessons Learned from Existing State Programs

What is the Problem with Electronic Waste?

Used electronic products are the world’s fastest growing waste problem due to their quantity, rapid obsolescence, and toxicity. Electronic wastes contain toxic substances, including lead, mercury, cadmium, lithium, brominated flame retardants, and phosphorous coatings. These toxic materials can be released upon disposal, posing a threat to human health and the environment. Inconsistencies in worker safety and environmental protection mean potential liability concerns for those sending electronics to recycling facilities—especially if these facilities are located in developing countries.

How is Electronic Waste Currently Managed?

Twenty-three states have passed extended producer responsibility (EPR) laws requiring electronics manufacturers to establish collection and recycling programs for their products. California has taken a different approach, creating a state-administered and state-regulated program funded by an advanced recycling fee collected at the time of sale. Utah has passed a law requiring companies to report on their recycling activities. Twenty-one of the EPR laws have been implemented. As seen in Figure 1, according to the U.S. Environmental Protection Agency (US EPA) the quantity of used electronics sent to recycling facilities increased from 470 thousand tons in 2006 to 650 thousand tons in 2010, up by 38.2%. However, 1.79 million tons of used electronics were still disposed in landfills and waste to energy facilities in 2010. EPR laws for electronics have boosted the recycling of scrap electronics, recovered precious materials that were being wasted, and created thousands of recycling jobs while saving governments millions of dollars. Each law is different, however, and some laws have resulted in higher recycling rates and more efficient collection and recycling infrastructure.

While EPR laws have shown success in increasing electronic waste recovery rates, improvements need to be made. Most collection targets were too modest in early years, and many laws cover only a patchwork of equipment types, excluding important devices such as televisions, peripherals, and CPUs. Additionally, some laws place a greater financial or regulatory burden on manufacturers, and the lack of harmonization among state programs has led to increased complexity and compliance costs.

Figure 1: Tons of Electronics Disposed & Recycled in the US (2006-2010)
Which products should be included in an electronics program?
In deciding which products to include in their program, states have taken two basic approaches – some target a limited number of key devices, such as TVs and computers, to simplify the initial administrative burden of establishing the program. Others, however, accept an expansive list of products to obtain greater environmental and economic benefits. A wider scope can increase collection efficiency, apportion financial responsibility more fairly, capture more electronic materials, and simplify public messaging. Other states include only a limited number of “covered electronic devices” in their electronics law but accept a longer list of products for recycling, or ban a wider list of products from disposal. Alternatively, policy makers could opt for a phased expansion of covered products, starting with a smaller list to lighten the administrative burden of establishing the program, but expanding to a comprehensive scope of products to accrue environmental and economic benefits.

Who should be allowed to return e-waste?
All programs accept used electronics from residents. Some states such as New York also accept products from schools, nonprofits, and small businesses; and other states accept used electronics from anyone returning fewer than a certain number of units per day. States may base this decision on which sectors need the assistance and relief provided by manufacturer product stewardship programs; however, states that choose to accept non-residential material will want to raise their collection targets accordingly.

How can new electronic products be included?
Since technology changes rapidly, it can be difficult to draft legislation in a way that captures new products entering the market, such as digital tablets. Policy makers can avoid this difficulty by defining products based on their function (e.g., listing “video display device” rather than their specific name, “Cathode Ray Tube”). This allows for the scope of products to include newly developed products without the need for statutory amendment. Legislation should also be drafted in a way that allows policy makers to expand the scope of covered products by simply amending the definition of “covered electronic device.”

Table 1: Product Scope – Comparison of a Limited and a Comprehensive Approach

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<tr>
<th>Scope</th>
<th>Limited Scope</th>
<th>Comprehensive Scope</th>
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<tr>
<td>Products Included</td>
<td>Only major products (TVs, computers, &amp; monitors)</td>
<td>Most consumer electronics and peripherals (e.g., mice, keyboards, speakers, printers, DVD players, etc.)</td>
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<td>Advantages</td>
<td>May simplify the initial administrative burden of establishing the program, as officials need to identify a smaller number of responsible parties.</td>
<td>This is the environmentally preferred option, as more material is diverted from the waste stream. This approach simplifies consumer messaging, increases collection efficiency, and more fairly apportions program costs.</td>
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<td>Limitations</td>
<td>This approach has limited environmental benefits as a significant percentage of material falls outside the program and may be sent to landfills or incinerators. Also, many smaller electronics contain the same toxic or precious materials found in larger electronics. This approach also provides limited economic benefits by reducing the supply of materials available to recyclers, and may not fully relieve local government management costs. This approach may also confuse or frustrate residents wishing to recycle electronics not accepted in the program. If electronics that are not part of the program are accepted anyway, these products will be a financial strain on the program.</td>
<td>This approach requires identifying a larger number of responsible parties at the start of the program. This challenge will diminish with time, however, as states developing or expanding their programs will be able to benefit from the work of previous states.</td>
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<td>Lessons Learned</td>
<td>Many states that adopted this approach are now revising and expanding their programs to include more products. For example, Hawaii, Illinois, Maine, Maryland, North Carolina, and Oregon have already returned to their legislatures to expand their scope of products accepted through their programs.</td>
<td>The most recent laws, including New York, have adopted a comprehensive scope. New York was able to reduce the administrative burden of identifying responsible entities using information from the Electronics Recycling Coordination Clearinghouse.</td>
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Assigning Responsibility

Who should be financially responsible for the program?

All 23 EPR laws hold the manufacturers that placed products on the market financially responsible for safely managing used electronics. It is important to establish a clear definition of the “responsible party” in legislation, although there is not yet a consensus on a preferred definition. New York’s 2010 law provides one example of a comprehensive definition of “manufacturer,” although it includes exemptions for small manufacturers. Maine’s program has a simpler definition of “manufacturer,” which may more clearly apportion responsibility, but does not include an exception for small manufacturers. The NY definition also exempts refurbishers to ensure reuse is not discouraged by a new regulatory burden.

How can states prevent free riders?

A level playing field can only be assured when all companies that should be adhering to the law are actually doing so. To make sure this takes place, state agencies need to identify non-compliant companies and take effective enforcement action. Determining the full list of companies that are legally responsible under a state’s law is a major implementation challenge. However, a list of manufacturers can be obtained from the Electronics Recycling Coordination Clearinghouse, from other states with existing programs, or through retailer audits.

How should cost be shared?

Legislators have a variety of cost-sharing options to choose from. Some states, including Connecticut, require their local municipalities to provide for collection of material, and require manufacturers to cover most of the costs associated with collection either through reimbursement or payment up front. Other states do not specify in statute which party should be responsible for the costs of collection. In these cases responsibility for collection costs is often determined in individual contracts between collectors and recyclers, though determining where collection ends and storage and transportation begin is an item of negotiation.

It is recommended that manufacturers bear the costs of collection, transportation, and recycling. The most recent state programs have apportioned these costs on the basis of market share, which many believe is an easier and more cost effective way to divide program costs (as compared to return share).

How can the government’s administrative and oversight burden be reduced?

Many states require manufacturers to remit an annual state registration fee. PSI recommends that registration fees only be used to cover the government’s costs of program oversight and administration, or to otherwise enhance the program (e.g., to cover the costs of public education campaigns). Annual registration fees should also allow for future adjustments to meet the actual program cost needs, and should be proportional to the company size to avoid burdening small businesses. In addition, some states with hiring freezes should consider including in legislation an authorization to hire the additional staff that will be needed to effectively implement the program.

Program Transparency & Reporting Requirements

State agencies require manufacturers to submit information about their recycling programs to the agency in both the initial program plan and in annual reports. At a minimum, PSI recommends that the following requirements be explicitly included in legislation to ensure transparency: (1) stipulate an opportunity for public comment prior to the state’s approval of manufacturer stewardship plans, and (2) require annual reporting to ensure adequate performance and the ability to improve program design. Gathering these data is particularly important during the initial program years to identify problems and implement necessary reforms. Reporting requirements will vary depending on the performance metrics used, but should generally include the following aspects:

- Estimated quantity of e-waste available for collection.
- Quantity of material collected and level of convenience offered, compared to collection and convenience targets.
- Overview and evaluation of education and outreach efforts.
- Recyclers and processors used.
Who should be responsible for education and outreach?

The success of any recycling program hinges on public participation. Educating the public about the importance of recycling their old electronics requires a concerted effort from both the public and private sectors. While all stakeholders have a role to play, there are advantages to assigning primary responsibility to one sector. The advantages and challenges of assigning responsibility to the various stakeholders are outlined below.

- **Manufacturers** are ultimately responsible for ensuring that high rates of scrap electronics are collected and recycled. Therefore, most states hold manufacturers responsible for education and outreach efforts, which can include financial and/or other incentives for consumers to return used equipment. Manufacturers also have the capacity to create statewide advertising campaigns if they coordinate their efforts. In addition, these companies have the necessary expertise, experience, and resources to effectively educate their customers. States report, however, that it is difficult to measure the effectiveness of these efforts and difficult to enforce legal requirements.

- **Retailers** have a great opportunity to educate consumers about the problems associated with the improper disposal of scrap electronics because they have the most direct contact with consumers at the point of sale. It is difficult to enforce laws requiring retailer involvement in public education due to the large number of individual entities.

- **Governments** have developed and provided outreach materials in most state programs. While most states with laws require manufacturers to bear primary responsibility for education and outreach, state agencies can be particularly effective in distributing consistent materials throughout the state and ensuring effective consumer messaging. Washington, for example, has created E-Cycle Washington, which uses a consistent brand, images, and language (see Figure 2). The state also keeps a centralized list of electronics take-back locations. Some states prefer to operate their own education and outreach program because they find it burdensome to review and approve multiple manufacturer outreach plans. Certain states also allow manufacturers with an approved educational program to “opt-out” of a default state-run education program. On the other hand, placing this responsibility on government can strain staff time and resources unless additional funding is provided.
Measuring Performance

Why measure performance?
The most important lesson learned from existing programs is that establishing performance targets and measuring performance are critical to increase reuse and recycling. States with strong performance requirements have been more successful in collecting and recycling a larger quantity of material than programs with weak requirements, as seen in Figure 3. While there are other contributing factors, such as the age of the recycling program, the states without performance targets (shown in red) have achieved significantly lower recycling rates. Strong performance targets motivate manufacturers to collect an environmentally and economically significant volume of material. Additionally, in states without collection requirements, manufacturers have shared the collection burden unequally. In Texas, for example, just four manufacturers (out of 78) recycled 92 percent of all e-waste collected in 2009, and 36 manufacturers collected no e-waste at all. Establishing clear, achievable, and strong performance targets creates a more level playing field and reduces the free-rider problem.

How should performance be measured?
The most effective performance targets are those that set high standards, are easy to understand, and are adaptable to changing market conditions. Most importantly, they must be widely accepted and based on transparent and accessible data. Most states use one or both of the following types of performance metrics: collection targets and convenience requirements. Ideally, programs will include both metrics to ensure that a high percentage of the waste stream is collected (as specified in the collection targets), and that the program serves residents from all parts of the state throughout the year (as specified in the convenience requirements). There are exemplary programs that use only one of these metrics, such as Washington State, which established only convenience requirements. Despite the success of this particular program, PSI recommends state programs include both convenience and collection requirements to fairly apportion responsibility for the program and ensure high performance. Table 2 provides an overview of the two types of metrics.

Table 2: Collection and Convenience Standards

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<th>Description</th>
<th>Mandatory Collection Targets</th>
<th>Mandatory Convenience Metrics</th>
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<td>Establishes a minimum amount of material to be collected and can be measured in pounds per capita or as an overall collection rate (e.g., the amount collected compared to the amount available for collection). If measuring the collection rate by the quantity of products sold in the state, sales data should be provided to the state, and sales from previous years should be used to account for product life span.</td>
<td>Establishes a minimum number of collection sites or services (by area or population) that must be available to residents. Some programs have specified the minimum number of days or hours that collection sites must be open. Washington and New York, for example, require a collection site in every county, and also in every city or town larger than 10,000 people.</td>
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<td>Advantages</td>
<td>Establishing collection targets can ensure that a minimum amount of material is collected.</td>
<td>This approach is more adaptable to changing volumes of e-waste than fixed per capita targets. The amount collected at specific locations will fluctuate with the amount of waste generated.</td>
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<td>Limitations</td>
<td>Collection rates are more difficult to measure and enforce than a fixed collection target, but are more adaptable to changing market conditions. Fixed per capita targets may be difficult to adjust to rising generation rates.</td>
<td>If convenience targets are not paired with collection targets, government agencies or nonprofit organizations could bear the burden of increasing resident participation in the program.</td>
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<td>Lessons Learned</td>
<td>Many states lacking targets have had low collection rates. If convenience standards are not in place as well, manufacturers may stop collecting after achieving their goals. An alternative is to assign a recycling share of all that is collected to manufacturers based on their market shares.</td>
<td>Programs without strong convenience metrics have often left rural communities without adequate collection options.</td>
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Figure 3: Pounds of Used Electronics Collected Per Capita in Select State Programs (2009)

Additional Performance Metrics
Program performance should also be measured in terms of how collected material is handled, including the amount of material diverted for reuse and refurbishment, the use of responsible recycling facilities, and the recycling efficiency (the total weight reused and recycled as a percentage of the amount captured). A disposal ban is an important policy tool that will help divert material from the waste stream. In addition, states may require manufacturers to measure the effectiveness of their education and outreach initiatives to ensure consumers know where and how to recycle their e-waste.
The best programs should go beyond focusing solely on collecting high volumes of waste and should also encourage reuse and increased recycling efficiency (the percentage of material collected that is actually recycled). Most importantly, programs should ensure that materials are refurbished or recycled using environmentally sound methods. This can be done by incorporating existing recycling standards into legislation or by developing unique standards through regulation. Minimum environmental standards should be clearly established in statute to ensure that material is recycled in a safe, environmentally sound manner and not exported to nations where dangerous techniques such as open-air burning and acid baths may be used to recover valuable components.

Using existing recycling standards presents less of an initial administrative burden and can support the widespread adoption of best management practices. However, state agencies do not maintain control over the content of the standards as they are changed and updated.

There are two prominent standards states can adopt:

**e-Stewards**: This standard is a project of the Basel Action Network, a non-profit organization. The e-Stewards certification strictly prohibits exporting hazardous e-waste to developing countries and prohibits the use of prison labor. Rhode Island has elected to use only e-Stewards certified recyclers for services contracted under its state-run program.

**Responsible Recycling (R2) Practices**: This standard is overseen by R2 Solutions, which is a non-profit organization established to house the R2 Practices. The R2 Practices shares many of the same requirements as the e-Stewards standard. However, it does not require a licensing fee, and does not prohibit the use of prison labor nor the export of e-waste components to developing countries.

Developing new standards presents a greater initial administrative burden for an agency, but allows the state to retain control over specific requirements. For example, Connecticut has developed its own regulation based on the U.S. EPA’s Plug-in to eCycling standard. These standards require minimal use of incineration and landfilling, as well as the licensing and implementation of environmental management systems for related facilities. They also allow only products intended for reuse or refurbishment to be exported. The adoption of numerous state-specific standards, however, could increase company compliance costs.

**Encouraging Reuse**

Reusing electronics provides the greatest environmental benefit and should be aggressively encouraged. It is important to closely monitor these activities, however, because many units officially designated for “resale” are actually exported and irresponsibly discarded in developing nations. To prevent this practice, California and Washington allow only onsite refurbishment. To encourage reuse, some states have adopted a policy that provides additional collection credits for units that are reused rather than recycled. For example, manufacturers could be credited 1.5 to 2.0 pounds for every pound that is refurbished or reused. To provide a further financial incentive to encourage reuse, Washington allows collectors and manufacturers to resell fully functional units collected.

**Preventing Irresponsible Export**

The Basel Convention, which has been ratified by 175 countries, restricts the export of hazardous materials without consent from receiving countries, and stipulates that imported material must be managed in an environmentally sound manner. The treaty prohibits Basel Parties from trading with non-Parties (such as the United States) unless they have signed a separate bi-lateral or multi-lateral agreement. While the US has such an agreement only with nations in the Organization of Economic Co-operation and Development (OECD), some US entities nonetheless export hazardous waste to non-OECD signatories. In the US, the authority to ban the export of hazardous materials rests with the federal government. Legislation is currently pending in the U.S. House and Senate that would dramatically restrict the export of hazardous e-waste to non-OECD. This legislation has been supported by a consortium of companies, known as the Coalition for American Electronics Recycling. In the interim, several states have taken steps to mitigate the risk of irresponsible export, including restricting the export of all material collected for credit in the state program, unless a recycler meets certain criteria. For example, New Jersey has prohibited exports that pose a significant risk to public health and the environment. These laws may be difficult to enforce at the state level.
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References:

- The Responsible Electronics Recycling Act of 2011 (HR 2284 and S.1270).
- “WEEELABEX Project” Waste Electrical and Electronic Equipment (WEEE).