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This manual was written primarily by Lynn Rubinstein, Executive Director, Northeast Recycling Council, Inc. (NERC). John Leigh conducted the national survey of electronics recycling programs and coordinated the peer review process for this document.

March 2002

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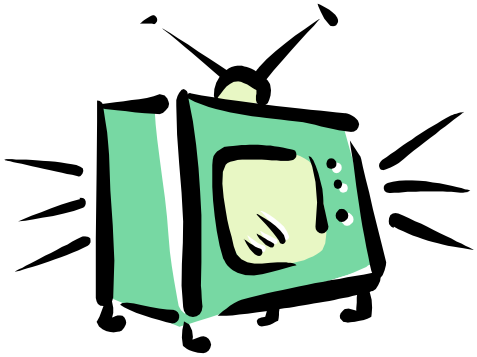

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Introduction

Used electronics recycling has become a growing concern for municipal and regional solid waste programs. The primary goal of this manual is to provide managers of these programs and other local officials with the basic tools to set up and operate effective electronics recycling/reuse programs by learning from the experiences of their peers. In order to provide this base of experience, a national survey of existing electronics recycling/reuse programs was conducted. The results of that survey and the experience of recycling coordinators and other recycling professionals provided the foundation for this document.

Because of the national need to learn from the limited experience that exists in the United States, this project enjoyed support from the Environmental Protection Agency Headquarters, and Regions 1, 2, 4, 8 & 9. This document is not region specific, but is applicable to anyplace in the U.S. It is being written in conjunction with the development of training workshops.

The second goal of this manual is to help empower the creation of more electronics recycling/reuse programs around the country, and thereby stimulate a reliable and predictable source of used electronics, which will lead to more used electronics recycling and reuse market development. As recycling markets expand and become more profitable, we can anticipate that the cost to recycle cathode ray tubes will decrease, and in time there might even be a positive value.

At the same time that this manual is being written (September – October 2001),[i] a national effort is unfolding to develop a system of product stewardship for computers and televisions. The "National Electronics Product Stewardship Initiative" (NEPSI), is a coalition of governments (federal, state, local, and regional), manufacturers of computers, televisions and other consumer electronics, retailers, software manufacturers, non-profits and public policy groups, attempting to create a strategy for shared responsibility between government and industry in the end-of-life management of electronics. The NEPSI process is scheduled to be completed in mid-2002, a likely result of which will be the additional availability of manufacturer and retailer recycling and take-back programs. It is not expected that these programs will completely replace government collection programs – however we can look forward to more end-of-life options and partnerships between government, manufacturers and retailers.

[i] This March 2002 version incorporates editorial changes resulting from a peer review, but the content of this document remains essentially the same as when it was first published for a series of training workshops held in October 2001.

Manual Contents

This document has four key components:

1. Section One: The results of the national electronics collection programs survey conducted between April and September 2001.

2. Section Two: General considerations for setting up and running any type of electronics collection program.

3. Section Three: Specific guidance about ongoing collection, special event, and curbside electronics collection programs.

4. Section Four: Appendices.

Sections Two and Three include the use of Checklist Tools. Bulleted lists with a check box (❑) indicate that we suggest that the list be used as a planning tool.

Background

There are two significant assumptions underlying this document, that the reader:

1. Is already aware of the environmental and public health issues associated with used electronics and that used electronics have hazardous constituents.

2. Wants to set up a collection program but either needs specific guidance, or needs to convince another decision-maker that setting up and operating such a program is practical for their service area. Non-collection options do exist for promoting electronics reuse and recycling, such as bolstering the collection or exchange efforts of other organizations in your region through effective outreach. This manual largely assumes the reader has already conducted or considered non-collection options and wishes for any number of reasons to become involved directly in supplemental collection.

This document uses the expression “used electronics” to refer primarily to computers and televisions. However, used electronics recycling/reuse programs often accept a wider range of electronics, including, but not limited to, computer and television peripherals such as VCRs and printers, portable phones and stereos.

National attention has focused on computers and televisions primarily because of the monitors, or cathode ray tubes (CRTs).

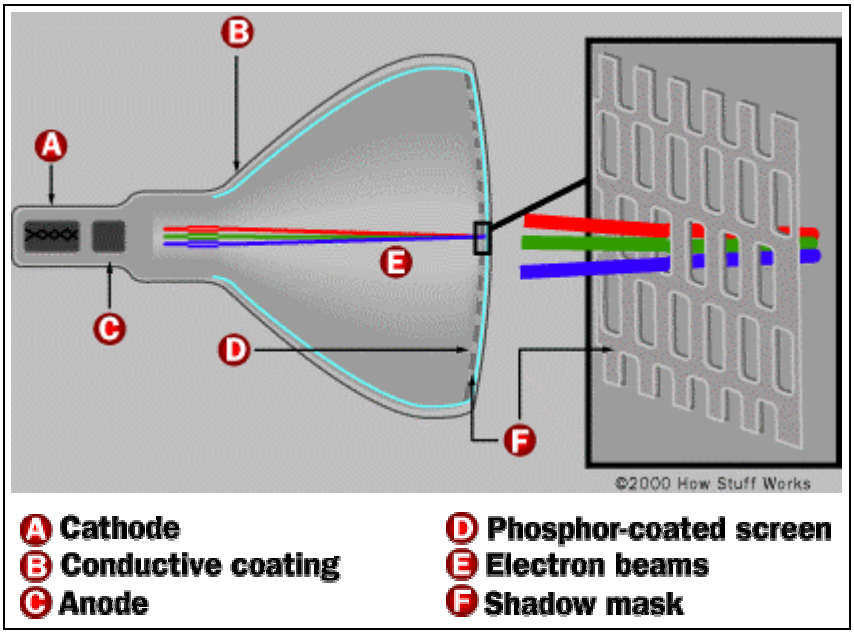


Figure 1: Cathode Ray Tube[1]

While simple in design, CRTs have triggered a wide-ranging and often contentious discussion around the world about whether they are hazardous to public health and the environment when disposed in the trash.[2] The reason is because color televisions and computer monitors contain leaded glass. The glass is leaded to protect the viewer from radiation: much in the same way that you wear a lead apron when you get an x-ray. The average CRT sold between 1995 and 2000, including televisions and monitors, is an 18.63-inch CRT with a lead content that varies from 2.14 lbs to 2.63 lbs.[3] The lead content is high enough to render them a hazardous waste by federal definition and to raise environmental and public health concerns; for example, when these toxic constituents become concentrated in incinerator ash. It is also stated that consumer electronics are the second greatest source of lead in the municipal solid waste stream, after batteries.[4]

Televisions and computers also contain lead solder, copper wires, and heavy and precious metals in the circuit boards. These, too, raise environmental and public health concerns.

There are those who believe that the current recycling alternatives for CRTs present more significant environmental concerns than does landfilling them. The emissions from lead smelters is their primary concern compared to the small likelihood that a CRT would ever leach lead in a RCRA Subtitle D (lined) landfill.

And, obviously, used electronics are bulky. They take up space in landfills,[5] are hard to manage in incinerators or waste-to-energy facilities, and have great recycling potential.

Section One - The National Survey

Learning From Existing Programs

In the fall of 2000, the Northeast Recycling Council, Inc. (NERC) received a grant from the Environmental Protection Agency to identify all residential used electronics collection programs that had been held in the United States and to conduct a survey of those programs to begin to quantify the costs, volumes, participation rate, and program efficiencies.

In order to accomplish this, NERC established an Advisory Committee with members from around the country and with different areas of end-of-life electronics management expertise. A complete listing of the Advisory Members is in the Appendix at page 2. The Committee helped to craft the survey, including identifying the key questions to be answered through analysis of the results. The development of the survey and a strategy for identifying and contacting all of the used electronics recycling/reuse programs in the United States took several months. Ultimately, the identification and surveying process began in earnest in January 2001. Survey responses included and analyzed in this document were received until August 2001.

This survey identified approximately 486 residential used electronics collection programs in the United States that have been held during the past three years. They represent twenty-nine states and the District of Columbia, with the majority having taken place in the past two years (2000 – 2001). This project attempted to survey every residential used electronics program that had been conducted. The results both confirm and negate assumptions about how collection programs work and the "best" approach. In this Section we will discuss the survey and the results. A copy of the survey is included in the Appendix on page 3. There was an impressive 41% response rate to the survey. The lessons learned from it have been incorporated into Section Two: Considerations for Any Collection Model.

Two caveats:
Caveat Number One – Many of the programs that we received information about had incomplete data. Because data collection is rarely a program priority, this is not surprising. However, as you will read in Section Two, we strongly recommend that data collection be incorporated into the design of programs in order to evaluate and improve the programs.

Caveat Number Two - Because there are 280 programs in Massachusetts and 80 of them responded to the survey – 45% of the total survey responses - the Massachusetts data risks skewing the analysis. As a result, in certain instances the data for Massachusetts was analyzed separately from the rest of the nation.

Why are there so many programs in Massachusetts? On April 1, 2000 a waste ban[6] on cathode ray tubes went into effect in Massachusetts. By that time, the State had done several years' worth of outreach and education to its municipalities and solid

waste facilities. Specifically, in 1998 Massachusetts began a multi-faceted initiative for recycling market development for used electronics. Significant elements of this program included:

- Changing its solid and hazardous waste laws to deregulate cathode ray tubes as a hazardous waste if handled for recycling, and banning the disposal of CRTs from any solid waste disposal facility in the State.

- Working aggressively with television repair businesses, recycling companies, and charities to develop an infrastructure to handle statewide generation of used electronics from all residents.

- In partnership with Salvation Army and Goodwill Industries, establishing regional used electronics recycling hubs around the State.

- Providing technical assistance and financial support to communities to begin CRT recycling programs by providing directed technical assistance and establishing a grant program to subsidize the cost of recycling televisions and computers for a one-year period.

- Establishing a state contract for recycling of electronics (including all packaging and transportation).

By July 2001, 75% of all Massachusetts communities offered used electronics recycling programs - and 91% of Massachusetts residents live in those communities. Since Massachusetts has so many programs and so many well developed programs, it has the potential to offer many interesting examples and experiences to would-be or start-up electronics collection programs.

Adequate markets and market development is essential for providing appropriate outlets for collected materials. There is certainly a chicken and egg element, but to date, government has taken the lead in setting up programs, providing dependable streams of recyclable materials, and providing the foundation for markets to develop and grow in their region. Massachusetts has proven that electronics are not an exception to this rule.

The Massachusetts Department of Environmental Protection, referring to its success, comments that "the lesson learned is that a disposal ban, in concert with an aggressive market development plan and incentive grants to municipalities, is a very effective means of establishing an electronics infrastructure. It is important to note that the Massachusetts waste ban regulations do not require municipalities or generators to establish collection programs. The disposal ban applies to the disposal facilities only. But, by offering grants to municipalities who are willing to launch a collection program, the state has provided an incentive and rewarded proactive involvement at the municipal level."[7]

The Survey Results

1. Which States Have Programs?

While public interest and media attention on the issue of used electronics is just beginning to gain momentum, many communities took the lead and launched into the business of used electronics recycling without examples to follow. In many cases, these programs were the first in their state or region, and, often, they still are. When we consider the entire country, we see that these pioneer programs represent quite a depth of experience. We found that at least one used electronics collection event has taken place in twenty-nine states and the District of Columbia.

Each of these programs was asked to respond to a simple survey in order to provide the first national baseline of information about these programs. A total of 425 survey requests were distributed by email, fax, and mail. One hundred and seventy-six (176) survey responses were received; a 41% response rate. The survey was posted on NERC's website and people were asked to complete it on-line. The results of those responses are analyzed in the following discussion.

Best Buy Collection, Framingham, Massachusetts

Figure 2: State Distribution of Programs and Survey Responses

State	Number of Identified Programs	Number of Programs that Responded to Survey
Arkansas	2	1
California	22	7
Colorado	6	2
Connecticut	6	2
Delaware	2	0
Florida	6	4
Illinois	13	5
Indiana	5	3
Iowa	2	2
Kentucky	1	0
Maryland	4	3
Maine	1	1
Massachusetts	280	80
Michigan	10	7
Minnesota	30	12
North Carolina	11	5
Nebraska	1	1
New Jersey	20	8
New York	15	5
Ohio	6	3
Oregon	4	4
Pennsylvania	5	2
Rhode Island	1	1
Tennessee	1	0
Texas	9	4
Virginia	6	5
Vermont	7	4
Washington	2	2
Washington DC	1	1
Wisconsin	6	2
Total	**486**	**176**

Figure 3: Where Are the Programs Located?

Region	States	Number of Programs
Mid-Atlantic	DE, MD, NC, VA, DC	24
Mid-West	IL, IN, IA, MI, MN, OH, NE, WI	73
Northeast	CT, MA, NJ, NY, PA, RI, VT	55
	MA	280
South	AR, FL, KY, TN, TX	19
West	CA, CO, OR, WA	34

2. Types of Programs

Prior to this survey, common wisdom indicated that most programs were special events. While a significant number of programs are special events, 45%, a slightly higher number of programs are ongoing collection programs, 47%. Only 8% of programs are curbside.

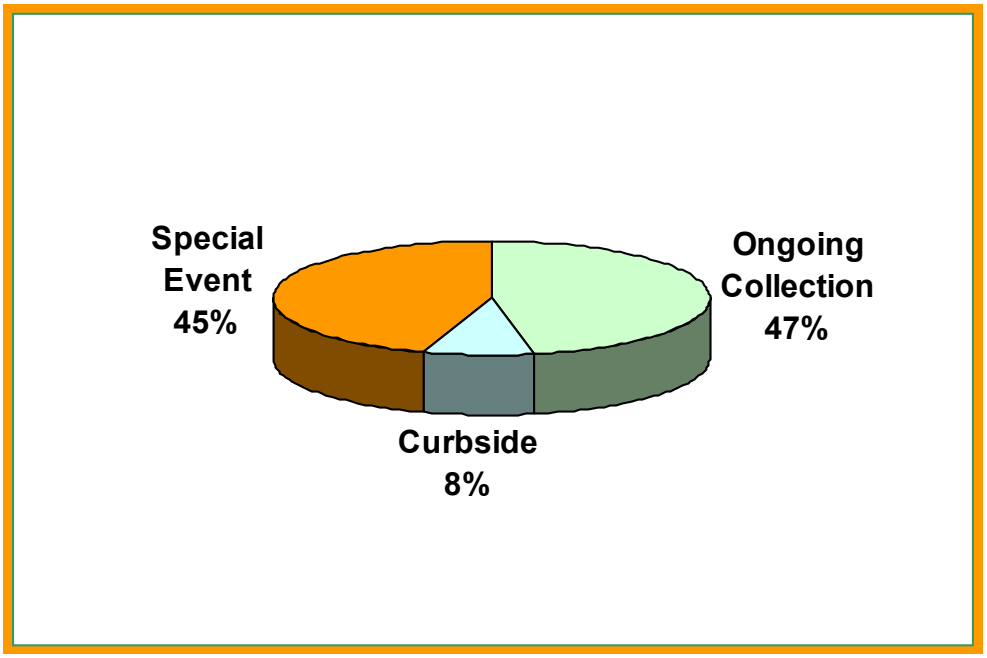


Figure 4: Distribution of Programs by Principal Collection Method

3. Types of Programs Relative to Population

There is a definite correlation between community size and program type. Curbside programs had the lowest average population served by program type (63,495), while special events had the highest average population (221,437).

Figure 5: Programs Relative to Populations Served

Program Type	Total Population of Survey Responses	Percentage of Total Population of Survey Responses	Average Population Served by Program Type
All Programs Combined	33,471,761	100%	194,603
Curbside	888,928	3%	63,495
Ongoing Collection	16,639,356	50%	193,480
Special Event	15,943,477	47%	221,437

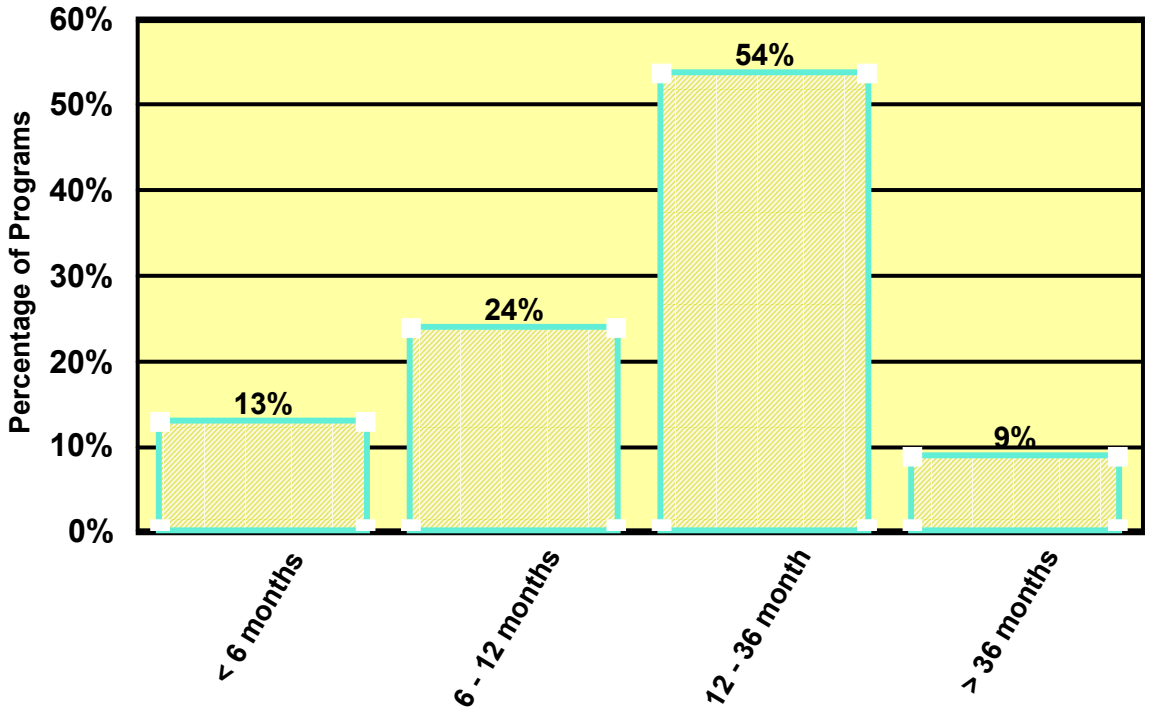
Los Angeles, California (population 3,694,820, ongoing Collection and special events program) is the largest city that responded to the survey and Washington, Massachusetts (population 544, ongoing Collection program) is the smallest.

4. When Programs Began

The study results support the general understanding that most programs began recently. Almost all of the programs began within the past four-year period (1998 – 2001). The momentum of program creation appears to be accelerating. Approximately one-half of the programs began or took place within the past year, and an approximately even percentage began or took place within the past two years. Overall, the average period of time since programs began is 19 months.

Figure 6: Program Age

As of July 1, 2001

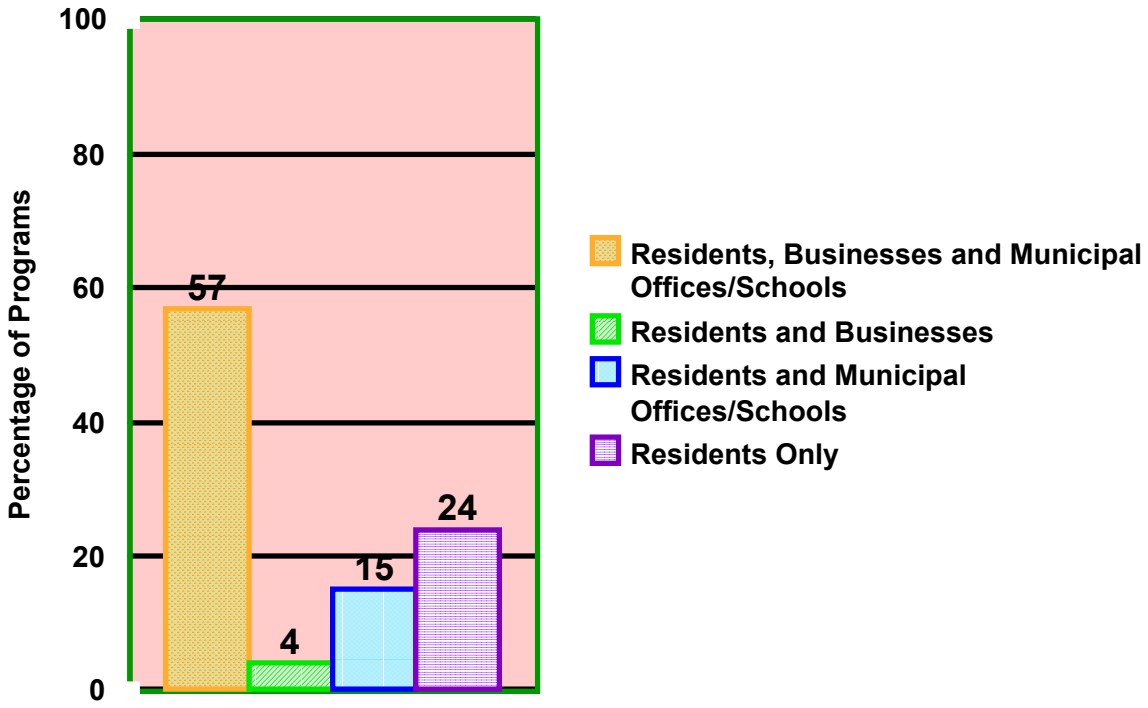


5. Who May Participate in the Programs?

Different programs are open to different audiences. All but one program, Lincoln, Nebraska, reported that its primary target audience is residents. In addition, most programs also allow small businesses and municipal buildings (especially schools) to participate. Many of those that do not specifically invite small business participation noted that they accept small amounts of used electronics from businesses on an informal basis.

Overall, programs are more inclined to accept materials from municipal buildings and schools than from small businesses. However, with the exception of curbside programs, small businesses are finding that the majority of collection and special event programs are open to them. Only twenty-four percent of programs strictly limited participation to residents only. However, several programs have different requirements for small businesses than for residents (i.e., pre-registration, paying the vendor directly, a higher user fee, pre-packaging their materials, calling the company directly, preparing a list of materials prior to arrival, etc.).

Figure 7: Who May Participate?



6. How Many Participants Can You Expect?

On average 1% of households participate in electronics collection programs. This is similar to household hazardous waste programs in that the percentage of the population that participates is not yet very significant. Over time we hope to see a greater response to electronics collections, but to date the concept of electronics recycling is new to both the public and municipalities.

Figure 8: Participation Rates

Collection Method	Average Number of Households Participating/Year/Program	Average % of Households Participating/Year
Ongoing Collection	1,019	1%
Curbside	732	1%
Special Event	463	1%
Overall	738	1%

7. Which Materials are Being Collected?

Computer monitors are collected in all of the programs, while televisions are collected in 77% of the programs. Outside of Massachusetts, televisions are collected in only 64% of the programs. Televisions are often excluded because the cost to recycle them can be higher than for computer monitors, and there are fewer reuse opportunities as well. The high percentage of plastic, wood, and low value materials, combined with the typically large CRT, make televisions a particularly difficult commodity for vendors to recycle.

Best Buy Collection, Framingham, Massachusetts

Figure 9: Materials Collected

Collection Method	Material Accepted	Percentage of Programs
All Programs Combined	Televisions	77%
	Computer Monitors	100%
	Computer Hardware	84%
	VCRs	67%
	Computer Peripherals	83%
	Other	46%
Curbside	Televisions	86%
	Computer Monitors	100%
	Computer Hardware	43%
	VCRs	36%
	Computer Peripherals	43%
	Other	14%
Ongoing Collection	Televisions	85%
	Computer Monitors	100%
	Computer Hardware	83%
	VCRs	69%
	Computer Peripherals	82%
	Other	38%
Special Event	Televisions	65%
	Computer Monitors	100%
	Computer Hardware	93%
	VCRs	69%
	Computer Peripherals	92%
	Other	51%

8. Amount of Material Collected

Supplemental information provided to NERC as part of the survey process revealed that the average amount of material per vehicle that comes into special event collections is 118 pounds.

Figure 10: Amount of Material Collected Per Vehicle

State	Community	Vehicles	Pounds	Pounds/Vehicle
California	Napa	1,035	140,000	135
	San Leandro	100	21,440	214
Florida	Leon County	416	31,000	75
Illinois	Best Buy, Northern Cook County, IL	313	32,200	103
	Solid Waste Association of Northern Cook County, IL (4 events)	3,690	446,400	121
Iowa	Cedar Rapids	400	44,000	110
Maine	Auburn	178	16,125	91
	Portland	700	49,319	70
	Tri County	100	11,168	112
Massachusetts	Best Buy, Framingham	393	41,551	106
Michigan	Eaton County	220	24,475	111
Minnesota	Washington County	583	44,320	76
North Carolina	Cabarrus County	285	59,400	208
Oregon	Lane County (2 collections)	375	75,080	200
Washington	Clark County	220	24,000	109
Total		**9,008**	**1,060,478**	
Average Pounds/Vehicle				**118**

Vancouver, Washington

Because programs are relatively new, and for special event programs much of the data is for a one-time event, these figures should be used as an approximate scale of how much material you might expect to see at your program.

Figure 11: Annual Average Per Capita Collection Rates

Program Type	Pounds Collected Per Capita
All Programs Combined	1.9
Special Event	4.8
Curbside	.56
Ongoing Collection	1.73

Massachusetts, which has had dozens of programs operating for two years, provides a different perspective on this data. By combining all program models together Massachusetts has found that the average weight is 1.65 pounds per capita annually, quite similar to the national results.

As a point of information, ElectroniCycle, an electronics remanufacturer and recycler in Massachusetts, reported the following average weights:

Figure 12: Average Weight of Computers & Televisions[8]

Electronic Equipment	Weight (lbs)
Computer (CPU, monitor, keyboard)	50
Television (15" – 21")	35 - 50
Console Television	125+

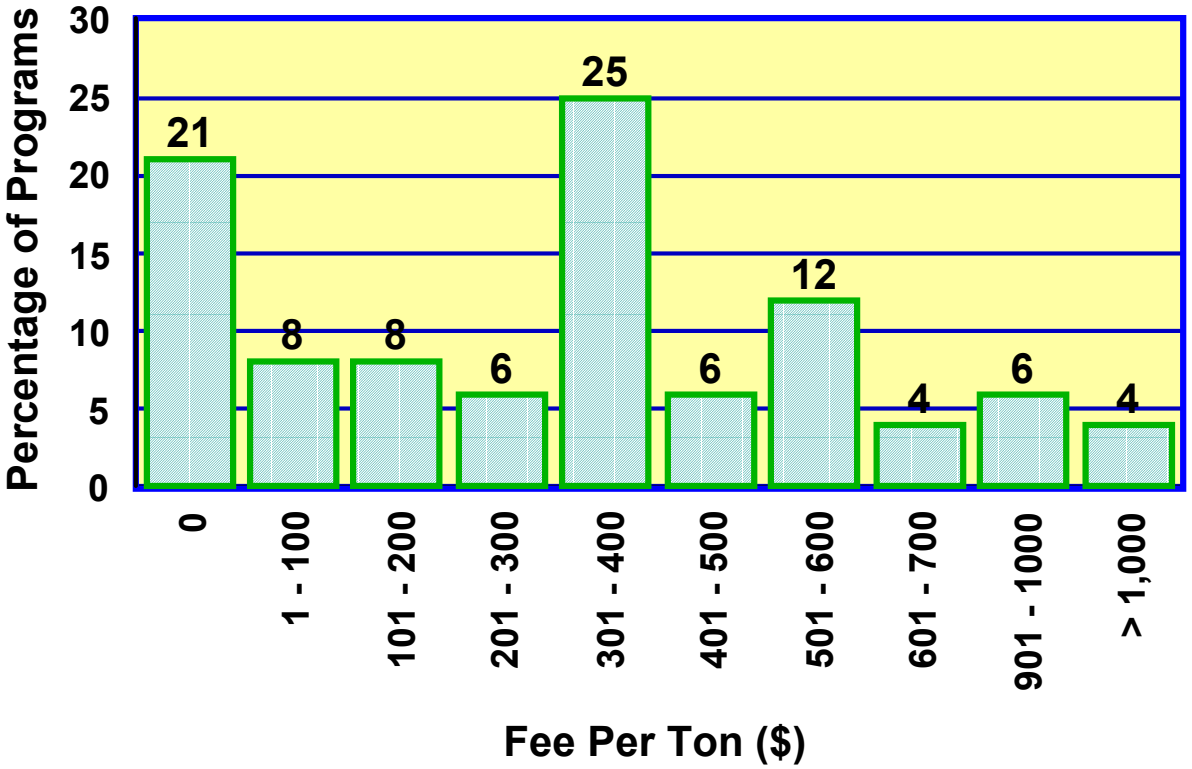
Televisions, in particular, come in a wide variety of sizes and weights. There are many 125+ pound console televisions that people are delighted to have out of their house.

9. Recycling Fees Being Paid

This is an instance in which Massachusetts' data was initially considered separately due to the number of programs with consistent pricing through the use of a state contract for electronics recycling. In Massachusetts a state contract provides that the recycling fee is $260/ton or $300/ton for materials that are delivered by the community to the two state vendors' facilities in Massachusetts. A second state contract includes transportation of materials from the municipal site to the vendor. Pricing under this contract is $300/ton for loads of 2,000 pounds or more, or $500/ton for loads that are less than 2,000 pounds. Most communities are able to accumulate this minimum threshold before shipping. The price includes transportation and packing materials. The minimum required for pick-up is only 200 pounds, which ensures that every municipality, no matter how small or large, can use the state contract. Surprisingly, when the rest of the responses are considered without Massachusetts, the average price is consistent with Massachusetts: approximately $330 per ton for recycling computers and televisions and their peripherals.

The range of recycling fees outside of Massachusetts vary widely: from receiving revenues of $20/ton in Indiana, to several programs paying no recycling fees, to highs in excess of $1,100/ton in Iowa and Pennsylvania.

Figure 13: Range of Recycling Fees



Surprisingly, approximately the same proportion of the programs pay "nothing" per ton as pay $350 or $500/ton.

A few observations about the reported recycling fees:

1) There are geographic patterns in the fees being paid. This is due to the recycling markets in their area. For example, one half of the North Carolina survey responses reported a "0"-recycling fee. This is because the programs use a company that, until now, has not charged any fees. The company's strategy has been to repair, remanufacture, and sell as much equipment as possible. Increasingly, however, handling of cathode ray tubes has become a problem for that vendor and so it has now instituted a per monitor fee. As a result, we expect to see "0" and low recycling fees shortly to become a thing of the past.

2) Some of the very high recycling fees reflected high transportation costs to the recycler.

As can be seen below, the most expensive region is the Mid-West and the least expensive is Texas. This, of course, is a generalization based on the limited information received from survey respondents.

Figure 14: Recycling Fees By Region and State

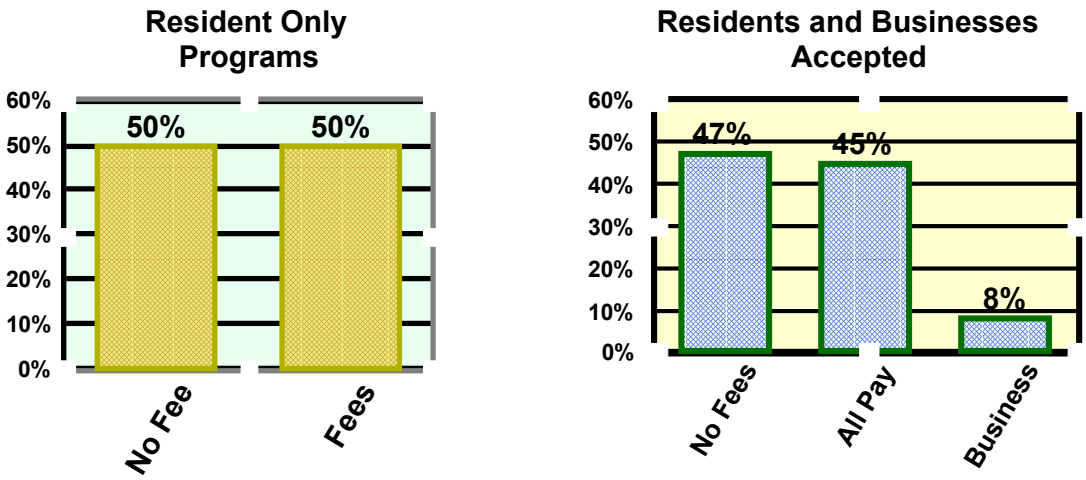
Region	State	Number of Responses	Recycling Fees Per Ton		
			Low	High	Average
South	Arkansas	1	$250	$250	$250
	Florida	4	$400	$600	$500
	Average		$325	$425	$375
Mid - Atlantic	Maryland	3	$0	$180	$90
	North Carolina	5	$0	$351	$168
	Virginia	5	$0	$500	$370
	Washington DC	1	$350	$350	$350
	Average		$88	$345	$245
West	California	7	$0	$750	$300
	Colorado	2	$0	$300	$150
	Oregon	4	$0	$400	$117
	Washington	2	$50	$600	$325
	Average		$10	$410	$178
Texas	Texas	4	$0	$300	$117
East	Connecticut	2	$363	$363	$363
	Maine	1	$322	$322	$322
	Massachusetts	80	$0	$520	$314
	New Jersey	8	$60	$360	$172
	New York	5	$197	$600	$500
	Pennsylvania	2	$350	$1,180	$765
	Rhode Island	1	$50	$50	$50
	Vermont	4	$250	$350	$320
	Average		$177	$416	$312
Mid-West	Illinois	5	$145	$260	$200
	Indiana	3	Paid $20	$380	$290
	Iowa	2	$300	$1,100	$700
	Michigan	7	$0	$680	$297
	Minnesota	12	$500	$950	$628
	Ohio	3	$0	$200	$102
	Wisconsin	2	$500	$500	$500
	Average		$204	$581	$388

Approximately 12% of the respondents indicated that the recycling fees that they pay to vendors apply only to CRTs and that the balance of the material is accepted at no cost. Sometimes the fees are per ton and in other cases they are per unit. There may even be a different price depending on the size of the unit, for example, a 19" television versus a console television.

10. Is the Public Paying a User Fee?

One of the many topics of debate in the National Electronics Product Stewardship Initiative dialogue is the question whether the consumer should pay a user fee for recycling electronics. Currently, the only examples of electronics recycling user fees in the United States occur at the end-of-life management point (e.g., at the collection program). There are discussions, however, about adopting advance disposal fees[9] for electronics or other methods for consumers to pay for recycling at the time of purchase.

Figure 15: User Fee Frequency



So, what decisions have programs made in their own communities about charging user fees? Half of the programs are not charging any user fees. This is particularly interesting because 84% of the programs report that they accept materials from residents *and* businesses *and* municipal buildings. In addition, essentially the same number of programs charge a user fee for residents as do for non-residents. The implication is that many programs treat small businesses, municipal buildings, and residents in the same way.

The user fees being charged to businesses are often different than those charged to residents. While there are only a few programs that indicated that they charge user fees to businesses and not to residents, approximately 5% of those indicate that the business pays the vendor directly for the actual costs. In another subset of situations, the business user fees are roughly twice that as for residents. For example, Greenfield, Massachusetts charges $4/unit for residents, and $10/unit for businesses.

11. How Much Are the User Fees?

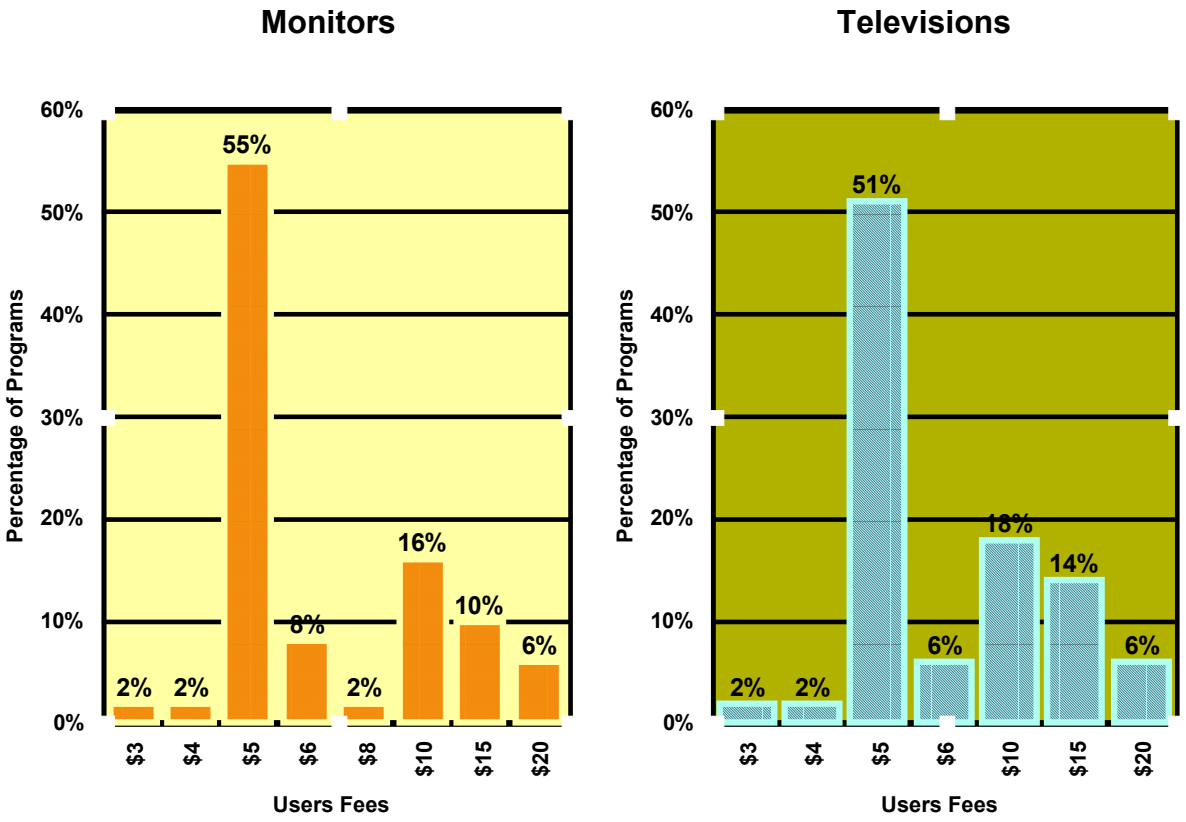
There is a surprising level of consistency in the user fees being charged. In many cases, the user fees are limited to computer monitors and televisions. There are exceptions, but in general the user fee charged for computer monitors and televisions is $5 each. The user fee is as low as $4 in a few cases and as high as $30 in others. In addition, many programs have a sliding scale user fee structure that is a function of the size of the CRT. For example, several programs charge $5 for a CRT that is 19" or less. If the television is bigger than that, or for a console television, the user fee doubles to $10. One program even has four different fees for four CRT size ranges. Another program draws the distinction between a "wood" television and a "plastic" television: a perfect description of the difference between a console and more modern television.

If you're going to charge a user fee, there are many ways to assign the costs:

Figure 16: How Are User Fees Set?

General Approach	Specific Method	Percentage of Programs
By Product Category	Televisions	63%
	Computer Monitors	63%
	Computer Systems (typically include monitor, CPU, keyboard, modem and mouse)	13%
	Peripherals (e.g., printers, scanners) – in addition to a fee charged for a monitor or a system	12%
By the Item	Separate fee charged for each piece or item	21%
By the Pound		4%
By the Vehicle		4%

Figure 17: User Fees for CRTs



Where fees are charged by the item or system, they range from $1 to $15. As before, $5 per "whatever" is the most common user fee.

12. How Are Operating Costs Funded?

While many surveys indicated that user fees are set at levels intended to cover the cost of the program, most programs are not covering the full costs solely through user fees.

Figure 18: Funding Characterization

Grant	User Fees	Budget	Combination
29%	35%	76%	40%

Municipal budgets are the primary mechanism for paying the cost of used electronics programs. These budgets are usually from the general fund, but in a handful of cases enterprise funds, i.e., dedicated funds generated by tip fees, are the source. But in almost one-third of all programs there is also support from user fees and/or state grants.

For *curbside only programs* there is an even split in reliance on municipal budgets and user fees.

For *programs that rely on a combination of curbside and ongoing collection programs* the balance of funding shifts: only one program relies purely on budget while the rest rely on a combination of grants and budgets.

Finally, *for programs that combine curbside and special event programs*, fully 60% of the programs rely purely on municipal budgets, and 40% use a combination of fees, grants and their budget.

In sum, curbside programs rely heavily on the municipal or solid waste budgets.

Ongoing collection programs and special events demonstrated very complex funding landscapes.

There are some consistencies between the funding patterns for ongoing collection and special events program funding.

- Municipal budget only is the primary funding vehicle, and is significantly more common than any other approach.
- Very few programs are able to sustain themselves on fees only.
- Grants, while playing an important catalyst role, are not a significant funding source for programs as a whole.
- Efforts to combine different funding tools are not widely used.

13. How Much Do Programs Cost to Set Up?

Set up costs include: staff time, supplies, equipment, and permitting to name a few. With the exception of some very large populations centers, e.g., Los Angeles, most programs reported that it costs less than $5,000 in time and expenses to set up their programs, and on average $3,086. In fact, a significant number of programs, 44%, reported that their set up costs were $1,000 or less. Fully 80% of programs reported that their initial set up costs were $5,000 or less. This was consistent across program type as well.

Figure 19: Average Costs to Set Up Programs

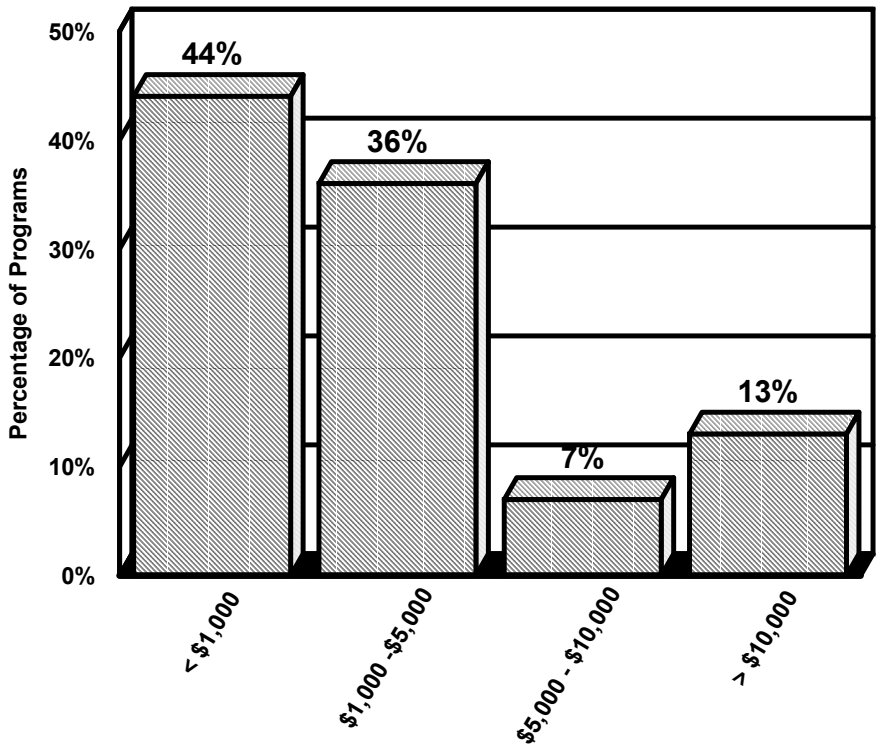


Figure 20: Set Up Costs by Population and Program Type

Population	Ongoing Collection	Special Event	Curbside
<10,000	$1,526	$500	
10,000 - 15,000	$3,333	$3,500	$2,167
15,000 - 25,000	$2,433	$1,333	
25,000 - 50,000	$2,625	$2,000	$1,750
50,000 - 100,000	$1,500	$4,744	$500
100,000 - 250,000	$4,800	$3,844	$4,000
250,000 - 500,000	$3,167	$4,250	
500,000 - 1 million	$2,375	$4,582	
>1 million	$7,667	$13,500	
Average	$2,689	$3,791	$2,889
Overall Average	**$3,086**		

The wide range of set up costs suggests that the details of the program design, rather than the program type, are the overriding determinant of the cost to set up. For example, if the program is very straight forward and merely an extension of an existing program (e.g., adding an electronics collection container at an on-going collection recycling center and electronics recycling/reuse markets are readily available) then the effort to establish the program will be nominal. At the other end of the spectrum, if the effort involves creating an entirely new program, working aggressively to determine the best markets and contracts, extensive publicity and training of staff, and purchasing of equipment, the set up costs will naturally be more.

14. How Much Do Programs Cost to Operate?

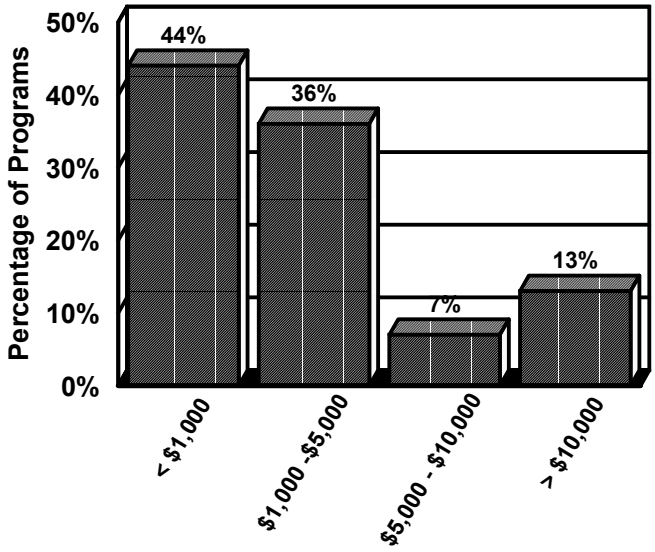
Operating cost includes staff, publicity, transportation, advertising, recycling fees, and any other ongoing expenses associated with operating the program. As with set up costs, operation costs vary widely. The variation is primarily related to recycling fees, transportation to the vendor, and the amount of material handled by the program.

Figure 21: Annual Operating Costs by Population and Program Type

Population	Ongoing Collection	Special Event	Curbside
<10,000	$7,400	$1,750	
10,000 - 15,000	$5,750	$4,625	$18,667
15,000 - 25,000	$5,367	$2,740	
25,000 - 50,000	$14,857	$6,313	$4,000
50,000 - 100,000	$8,300	$11,667	$15,250
100,000 - 250,000	$9,125	$10,321	$50,000
250,000 - 500,000	$14,167	$15,409	
500,000 – 1 million	$29,500	$13,143	
>1 million	$343,000	$30,000	
Average	$25,103	$10,672	$21,611
Overall Average	$18,718		

The overall average program costs were $18,718. The program costs at the high end of the range are clearly related to the higher populations. For example, programs with populations under 25,000 could be run with budgets under $6,000 per year. The majority of programs, 57%, are operating with budgets of $3,000 or less per year. The "expensive" programs – more than $10,000 per year – occur in only 28% of the programs, several of which are in large urban areas. The one extremely expensive program ($950,000) is Hennepin County, Minnesota. This was one of the first programs in the country and has been operating for almost 10 years. The volumes of materials are quite high, they accept a very broad range of materials, and the recycling fees that they pay for the electronics are high: $900/ton. In addition, the County contracts with a nonprofit organization to demanufacture the equipment. This social component also contributes to the cost of Hennepin County's program.

Figure 22: Operating Costs



15. How Do Program Types Compare for Cost Effectiveness?

Figure 23: Cost Effectiveness by Program Type

Program Type	Average Tons Collected Per Year	Average Operating Cost Per Ton Per Year
Special Event	23	$464
Ongoing Collection	56	$448
Curbside	71	$304
Overall	50	$374

This data indicates that curbside programs are clearly the most cost effective. Keep in mind, however, that we only received 14 survey responses from curbside programs: 12 of which were from Massachusetts. In addition, all of these programs were existing curbside bulky waste collection programs, and electronics were merely an added material to an existing list.

It is worth noting that ongoing programs receive almost two-and-a-half times as much material as do special events.

16. Who Operates Programs and Where Are They Being Held?

Local government (county, district, municipal) is taking on the majority of program management and hosting of collection-sites. Overall, government is operating 82% of all programs and is also responsible for 82% of the ongoing and special event collection-sites.

Electronics recyclers and charities are almost equally represented in program operation. More charities than recyclers host collections at their facilities. After recycling centers and DPW Yards, curbside and parking lots are the preferred locations for collection. The only reported programs operated by retailers or electronics manufacturers came from Minnesota, which has been the focus of several significant pilot efforts that explore and implement multi-stakeholder partnerships.

The percentages shown in the Figures that follow exceed 100% due to multiple collection-sites reported in the survey responses.

Figure 24: Overall Where Collections Are Held

Municipal Recycling Center	DPW Yard	Curbside	Parking Lots	Municipal Transfer Station	Public Property	Municipal Landfill	Public Fairgrounds	Other	Charity	HHW Facility	Electronics Recycler
39%	23%	14%	13%	7%	6%	5%	4%	4%	3%	2%	1%

Figure 25: Overall Who Operates Programs

Government	Electronics Recycler	Solid Waste Hauler	Charity	Electronics Manufacturer	Retailer	Volunteers/ Committee
82%	8%	8%	7%	1%	1%	1%

Figure 26: Where Ongoing Collections Are Held

Municipal Recycling Center	DPW Yard	Municipal Transfer Station	Municipal Landfill	Other	Charity	HHW Facility	Electronics Recycler	Curbside
60%	19%	13%	7%	5%	4%	2%	1%	1%

Figure 27: Who Operates Ongoing Collection Programs

Government	Solid Waste Hauler	Electronics Recycler	Charity	Volunteers/ Committee
91%	6%	2%	2%	1%

Not surprisingly, the percentage of ongoing collection programs that are managed by government (municipal and regional) approaches 100%. There are a few instances in which solid waste haulers are primarily responsible and an even smaller number where recyclers and charities take the leadership role.

Almost 100% of collection programs take place at municipal facilities. There are, however, some interesting examples of electronics recyclers and charities hosting the collection location.

Figure 28: Where Special Events Take Place

Parking Lots & Businesses	DPW Yard	Municipal Recycling Center	Public Property	Curbside	Public Fairground	Other	HHW Facility	Charity	Electronics Recycler	Landfill
30%	26%	19%	14%	10%	10%	4%	3%	1%	1%	1%

Figure 29: Who Operates Special Events

Government	Charity	Electronics Recycler	Solid Waste Hauler	Electronics Manufacturer	Retailer	Volunteers/ Committee
70%	12%	13%	7%	1%	1%	1%

As with the other program models, government plays the primary role for special event operation and locations. However, unlike the other program models, special events demonstrate a significantly higher percentage of programs being operated by non-government entities such as recyclers and solid waste haulers. The range of locations at which special events are held is also much broader, including such locations as fairgrounds and mall parking lots.

17. How Much Material is Being Diverted to Reuse?

The amount of material that is being reused is low. The reason generally given is that the age of the materials coming in makes them undesirable for the American market. As a result, some programs and recyclers are shipping computers and televisions overseas for reuse.

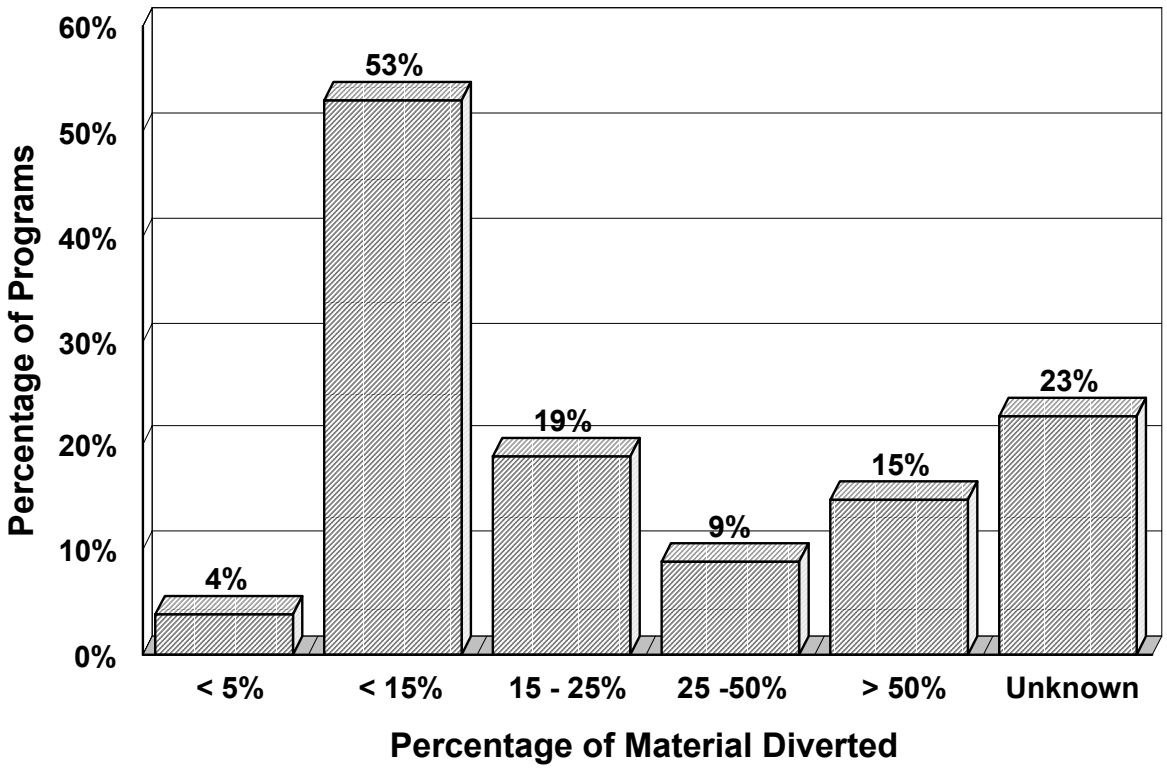
In addition, some charities report concerns and problems with licensing of operating software, removing information from CPUs, and other software related barriers which limit their ability to direct computers to reuse.

Many programs commented that they didn't really know how much reuse was taking place because the vendor was responsible for making those business decisions. Therefore, many of the responses were "educated guesses." Overall, 68% of the programs reported that reuse is an element of their program. This percentage is significantly lower than the percentage of programs that reported working closely with charities (89%[10]). The reason: many programs actively encourage residents and businesses to donate materials to charities before accessing the municipal recycling program.

Figure 30: Overview of Reuse

No Reuse	Yes Reuse
32%	68%

Figure 31: Percentage of Material Diverted to Reuse



18. How Often are Programs Offered?

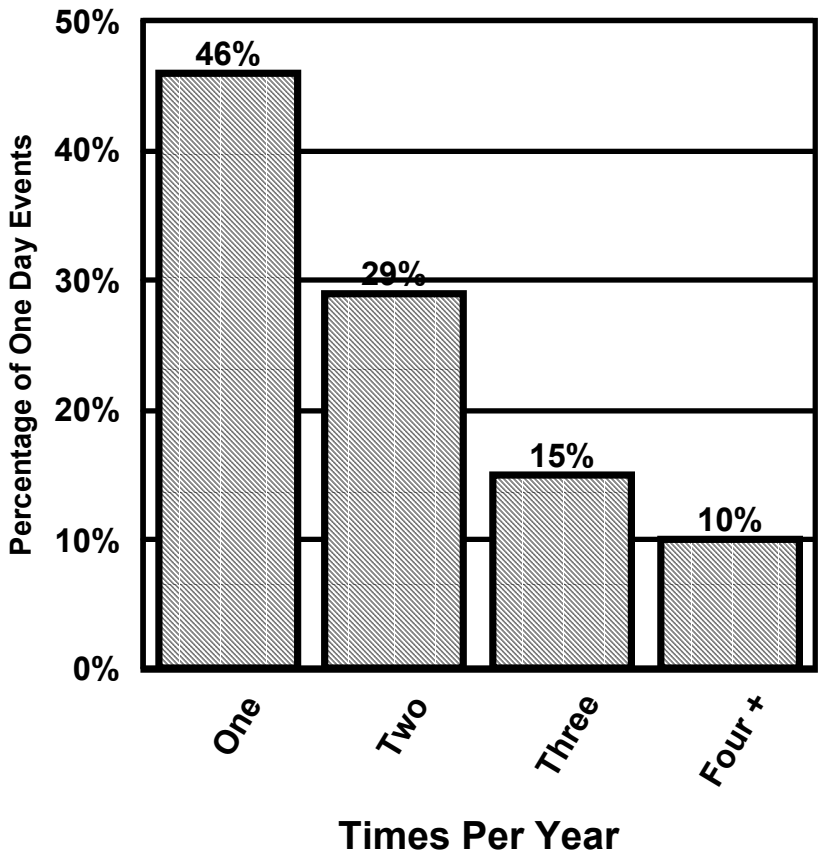
Figure 32: Frequency of Programs

Collection Method	Average Number of Days Per Year
Ongoing Collection	198
Curbside	54
Special Event	3

Overall, programs are very accessible. On average, curbside programs offer pick-up one day a week. Ongoing collection really is ongoing - averaging almost 4 days a week. And special events are also genuinely special - taking place only a few days a year. The surveys also revealed that 3% of special events are conducted through curbside service.

Most special events are one-day events (70%), but often the one-day events take place multiple times during the year. In fact, more one-day events take place multiple times per year than just once: 54% of programs offer one-day events at least twice a year.

Figure 33: Frequency of One-Day Events



On the other end of the spectrum, multiple-day events are represented by only 3% of special event programs. Of these, the majority are two-day events. In the case of two-day events and one-week events, they are both offered twice in the year.

Figure 34: Frequency of Multiple-Day Special Events

2 days	1 week	1 month
67%	17%	17%

19. Is There a Relationship Between Program Type & Median Household Income?

We wondered if community affluence was an indicator of the ability to have an electronics collection program. The data, however, indicates that there is no demonstrable relationship between program type and median household income.

Figure 35: Average Median Household Income by Program Type

Collection Method	Average Median Household Income
Curbside	$37,274
Ongoing Collection	$39,696
Special Event	$37,675

Nor did the range of median household income by program type reveal any different trends.

Figure 36: Median Household Income

Collection Method	Range of Median Household Income
Curbside	$25,144 - $53,225
Ongoing Collection	$21,480 - $53,333
Special Event	$23,156 - $69,917

20. Summary

Identifying all of the used electronics recycling/reuse programs in the United States proved to be both fascinating and a challenge. It was surprising to discover the abundance of programs and their dispersion across the country. Clearly, solid waste managers have perceived the need to collect electronics for recycling or reuse and have done something about it.

Overall, while the cost of recycling electronics is certainly higher than tipping fees for solid waste, we were heartened to discover how many programs are being run creatively, with tremendous cost efficiencies and with partnerships. In addition, the public is responding. While per capita collection rates and participation rates remain low, the statistics demonstrate that there is a demand for such services and a willingness to segregate electronics for reuse or recycling. While the participants in programs are obviously self-selected, there was also a demonstrated willingness to pay fees.

Based on the limited, and self-selected, information that was provided through this survey process, we offer several insights:

1. Curbside collection offers the greatest cost effectiveness in terms of cost/ton to operate and tonnage received.

2. The collection system with the greatest per capita results by weight is special event (4.8 pounds per capita, per year).

3. The most common type of electronics recycling program is an ongoing collection program (47%).

4. Most programs are extending their services to small businesses and municipal government (84%).

5. Outside Massachusetts, only 64% of the programs are collecting televisions.

6. At least one-quarter of all programs were unable to describe the ultimate fate of the materials that they are collecting.

7. Half of all programs are charging fees to either residents and/or businesses. The fees range from $4 to $30 for CRTs, but the average fee is $5.

8. Set up costs for creating a new program are low: almost half were $1,000 or less. The range of set up costs, however, was quite dramatic: $500 - $13,500.

9. 89% of all programs report incorporating a reuse strategy.

10. Half of all special events are held more than once a year.

As this document is being written more and more collection programs are being announced. This is a field in active transition. We are looking forward with excitement to what the next few years will bring in this field. Maybe, someday we'll get paid to recycle our televisions. Who knows . . .