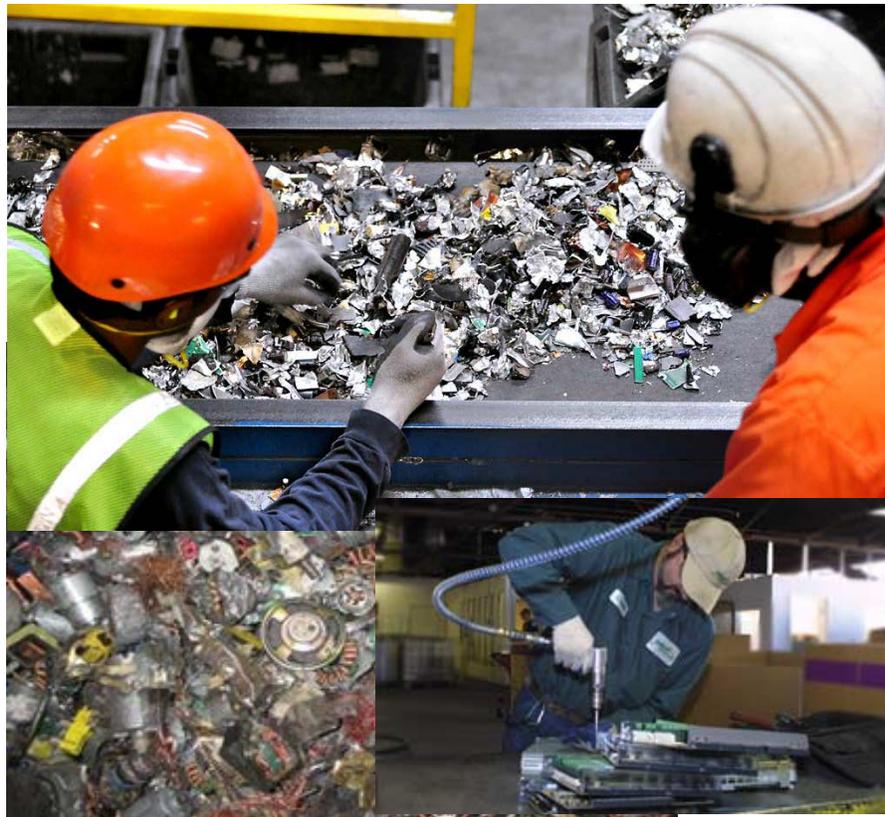


Jobs Through Electronics Recycling

Coalition for American Electronics Recycling

*Membership Survey and Jobs Study of the
Potential of the U.S. Electronics Recycling Industry*

FINAL REPORT | January 2013



Prepared by:

DSM ENVIRONMENTAL
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Executive Summary

DSM Environmental Services, Inc. (DSM) was contracted by the **Coalition for American Electronics Recycling (CAER)** to estimate the number of jobs associated with electronic waste recycling in the United States (US), and to project how many jobs might be created with increased electronic waste recycling activity carried out in the US.

CAER members represent a wide range of US electronic recyclers from large companies that perform other solid waste management and recycling functions to smaller companies solely engaged in de-manufacturing for the recycling of electronic components. CAER membership does not include brokers who aggregate and export untested electronics.

DSM surveyed 21 of 67 CAER members engaged in electronics recycling¹ representing 89 of 163 physical locations. The survey asked for three critical pieces of information from each company – employment, payroll, and annual throughput for the most recent year, as well as a breakdown of employment and throughput for the different activities undertaken within each facility. *Figure ES-1* (at right) illustrates the breakdown of employment by specific activities carried out by surveyed members.

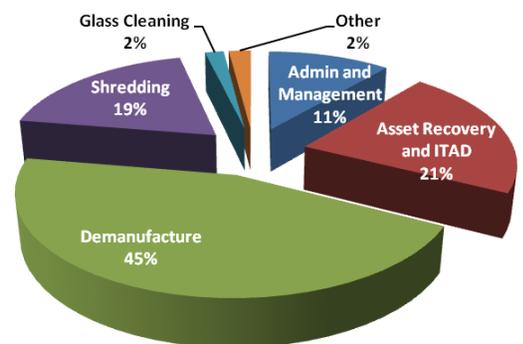
Survey results were then aggregated for small and large CAER member companies to calculate average employment, payroll and throughput

¹ At the time of this analysis (August, 2012), CAER membership was at 72 organizations including 5 affiliate members not directly engaged in electronics recycling activity. At the time of report printing, membership had grown to 77 organizations.

per location for both small and large companies. These facility location coefficients were applied to small and large CAER member companies that did not respond to the survey to estimate total employment, payroll and throughput for the entire CAER membership. Based on extrapolation of the survey results to the entire CAER membership, DSM estimates that CAER members **recycled nearly 1.2 billion pounds of electronics last year, employing roughly 6,850 people in the United States at an estimated payroll of \$250 million.**

According to the recent US EPA funded report, roughly 4.8 billion pounds of e-waste were generated in the United States in 2011.² Assuming that CAER members processed 1.2 billion pounds of material in 2011, the EPA report suggests that another 3.6 billion pounds of e-waste are being landfilled, processed by other domestic recycling companies or exported. This 3.6 billion pounds represents a potential 21,000 full time equivalent recycling jobs with a corresponding payroll of \$772.9 million and the potential for 21,000 additional indirect jobs through indirect and induced economic impacts.

Figure ES -1:
Employment by Activity at CAER Facilities



² See: *Characterizing Transboundary Flows of Used Electronics: Summary Report*. January 2012.

Introduction

DSM Environmental Services, Inc. (DSM) was contracted by the **Coalition for American Electronics Recycling (CAER)** to estimate the number of jobs associated with electronic waste recycling in the United States (US), and to project how many jobs might be created with increased electronic waste recycling activity carried out in the US.

As of August, 2012, there were 72 CAER member companies³ including five affiliates operating in 34 states, plus the District of Columbia. Of these, 67 member companies were directly engaged in some type of electronics recycling activity, operating out of 163 locations. CAER member companies process all types of electronic waste -- from consumer products to equipment used by the telecommunications industry -- and vary widely in their size and the types of electronics recycling activity that they carry out.

DSM's proposed scope of work required that a representative sample of CAER members agree to participate in confidential surveys conducted by DSM to obtain data on processes undertaken and employment, average payroll, and tonnage throughput.

Data gathered through DSM's surveys of CAER members formed the basis for an analysis of current jobs (and payroll) per ton of electronics processed for recycling. This included estimating throughput per employee per year for different recycling activities throughout their operations. These results were extrapolated to the entire CAER membership

³ CAER membership includes affiliate members who do not operate electronics recycling facilities.

engaged in electronics recycling activity⁴ to quantify the current value of the CAER portion of the US electronics recycling industry.

Most importantly, the data were also used to estimate the job impacts of increasing recycling of electronic waste in the US as opposed to brokering and export.

⁴ Note that the results do not include employment/jobs at affiliate members who are not directly engaged in electronics recycling activity.

Survey Method

Population Surveyed

CAER members represent a wide range of US electronic recyclers from large companies that perform other solid waste management and recycling functions to smaller companies solely engaged in de-manufacturing for the recycling of electronic components. While CAER membership does include affiliate members not directly engaged in electronics recycling activity but supportive of CAER's mission, these supporting members were not included in the survey and analysis.

CAER members include companies whose business model is designed around recycling or refurbishing of electronics from original equipment manufacturers and retailers, and companies that serve corporations and/or institutions that handle sensitive data and need to certify that all electronic devices are first cleared of all digital data before recovering any components. CAER members also include companies that are focused primarily on providing a recycling destination for electronics collected through municipal, regional or statewide collection programs or through retailer take-back arrangements.

CAER membership does not include brokers who aggregate and export untested electronics. In these cases the employment and value added materials are also exported, as are potential environmental damages from de-manufacturing practices in countries with lower environmental standards and fewer controls.

Because CAER does not include brokers who are primarily exporters, CAER membership is not

representative of the entire population of US based companies that handle used electronics, but is instead representative of those companies who de-manufacture or refurbish the electronic devices in the US.

As expected, there is a wide spectrum of types of electronics collected by different CAER members, and great variation in the value of the different electronic components recovered, leading to a wide range in de-manufacturing processes to remove potentially valuable components and materials. For example, CAER members who collect material primarily from municipal recycling programs receive large quantities of relatively low value old televisions, while CAER members who specialize in managing electronics from corporations and institutions receive much higher value electronics. But even in this case, there can be a significant difference in the value of the components recovered from the delivered materials.

In addition, TV peripherals such as VCRs, DVD players, DVRs, cable/satellite receivers, converter boxes, and game consoles, as well as mobile devices including cell phones, personal digital assistants (PDAs), smart phones, and pagers all vary greatly in components and value.

Because of the range in size, type and materials accepted by different CAER members, DSM attempted to survey as large a number of CAER members as possible based on the willingness of CAER members to participate. Ultimately DSM was able to obtain complete surveys from

21 CAER members representing 89 locations across the country.

Data Collection

DSM began the analysis by arranging plant visits with six CAER members located in the northeast. The goal was to visit representative facilities and interview facility managers so that DSM could better understand the types of activities carried out and the representative mix of components typically recovered from de-manufacturing. DSM conducted telephone interviews with several additional CAER members to supplement our understanding of the industry.

The plant tours were used to design the CAER member survey to capture relevant data on jobs from the different activities typical to most facilities. DSM then worked with members of the CAER Board to gain feedback on a draft survey.

The final survey (Appendix A) was sent out to all CAER members requesting that they follow up with DSM on any questions they might have.

The survey asked for three critical pieces of information from each company – employment, payroll, and annual throughput for the most recent year. As part of these surveys, DSM also asked for employment and throughput for the different activities undertaken within each facility. The following activity areas were designated in the survey:

- *Administration and Management* - Management, accounting, regulatory, and commodity sales;
- *Asset Recovery and IT Asset Disposition (ITAD)* - Certified data destruction and disposition of IT assets where the recycler has the capability to record make, model and serial number, and in some cases engages in refurbishment of equipment for resale;
- *Manual De-Manufacturing* – Manual de-manufacturing of electronic devices to recover the various components inherent in the devices (companies that have hard drive shredding technology only are included in this category);
- *Shredding* - Owns/operates shredding technology to shred electronic devices other than just hard drives and may include companies that have de-manufacturing facilities;
- *Glass Cleaning Technology* - Owns and operates technology to clean glass to the commodity level;
- *Smelter/Refinery* - Performs refining/smelting on site or at one of the company's locations; and,
- *Other Activities* - Collectors, drivers and other functions not listed above.

The data collected were entered into an *Excel* spreadsheet to analyze the results by location and to investigate outliers or unusual results. DSM followed up with those companies where results were atypical to ensure accurate data were used in the final analysis.

Results

Survey Results

As indicated above, DSM received completed surveys from 21 of CAER's 67 member companies that engage in electronics recycling activity (vs. affiliates or supporting members). These 21 surveys represent 89 of the 163 CAER member locations across the US.

In total, these 89 facilities employed 4,300 people and processed 715 million pounds of electronic waste last year, with a weighted average of 166,000 pounds processed per employee per year (rounded). Total annual reported payroll was \$158.4 million, or an average of \$37,500 per employee per year (rounded, including benefits and payments for temporary workers).

The *average* firm responding to the survey had four locations and 205 employees, and processed 34.15 million pounds of electronics. The average is skewed by some large members with multiple locations. The *median* company responding to the survey had 100 employees at two locations and processed 10.6 million pounds of electronics.

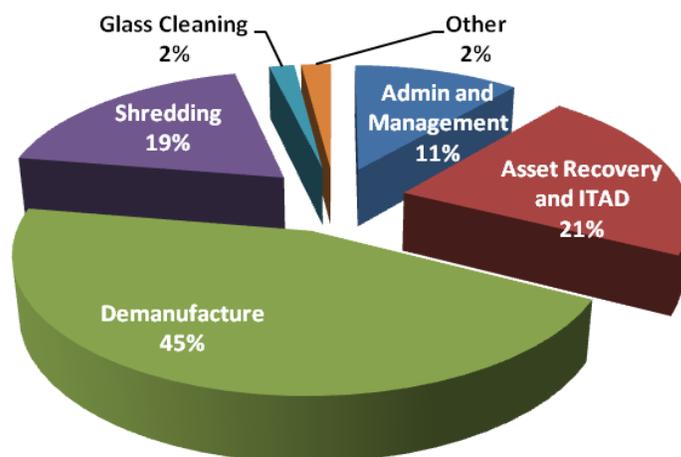
Allocation of Employment by Activity

On average, roughly 45 percent of employment was reported to be in de-manufacturing followed by 21 percent in asset recovery and ITAD functions, and 18 percent in shredding related operations. Roughly 11 percent of employees were engaged in administration and management activities including sales functions, while roughly two percent were engaged in glass cleaning related activities. Finally, the remaining two percent were engaged in other

company activities; primarily drivers engaged in collection or transfer of material between facilities.⁵

Figure 2 illustrates this breakdown of employment among surveyed CAER members.

Figure 2: Employment by Activity
(CAER Survey – 89 locations)



The total amount of material processed through each type of activity was also summed from the survey results. Table 1 illustrates that the surveyed CAER members processed 105 million pounds for asset recovery and ITAD, 252 million pounds (rounded) were de-manufactured, and 332 million pounds were shredded. Table 1 also shows that only 7 percent of glass goes through glass cleaning operations at CAER member facilities. This is because many CAER members do not own and operate glass cleaning equipment.

⁵ Numbers do not add to 100 percent due to rounding.

Table 1: CAER Survey Results, Throughput by Major Activity, In Annual Pounds (1)

| Activity | Annual Pounds | Percent (%) |
|-------------------------|---------------|-------------|
| Asset Recovery and ITAD | 105,206,478 | 13% |
| Demanufacturing | 278,432,324 | 34% |
| Shredding | 334,491,154 | 41% |
| Glass Cleaning | 52,999,030 | 7% |
| Other Activities | 43,769,486 | 5% |

(1) Numbers are greater than total pounds reported because some materials are double counted as they go through more than one process.

The breakdown of the average annual pounds handled per employee performing specific activities is presented in Table 2. Not surprisingly, asset recovery and demanufacturing functions among CAER members were significantly more labor intensive than shredding and glass cleaning (glass cleaning because of the high weight of CRT glass and automation).

Table 2: Average Annual Pounds Handled/Processed Per Employee from CAER Member Survey (Rounded)

| Activity | Average Pounds/Employee (FTE) Per Year |
|-------------------------|--|
| Asset Recovery and ITAD | 115,000 |
| Demanufacturing | 145,000 |
| Shredding | 421,000 |
| Glass Cleaning | 736,000 |
| Companywide: | 166,000 |

(1) Companywide accounts for all incoming materials and is divided by total employment including those in management, sales and administrative functions.

Extrapolation of Survey Results to all CAER Members

DSM used the survey results to project total employment, payroll and material throughput for the entire CAER membership based on the following methodology. Because of economies of scale associated with large companies, DSM extrapolated the survey results by aggregating responses by company size to create average employment, payroll and throughput at a single location for large and for small CAER member companies.

In order to define a business as small, the Small Business Administration (SBA) applies a size standard measured by gross receipts or number of employees above which a business can no longer be considered small. While these thresholds are developed for most business sectors classified under the North American Industry Classification System (NAICS), electronics recyclers are a relatively new industry without a unique classification code. Size standards for the 6 NAICS codes that may be used for electronic recyclers use \$12.5 and \$7 million in gross receipts and/or 100 or fewer employees, meaning that a company would be considered a "small business" if their average annual gross receipts or employment does not exceed these thresholds.⁶

⁶ For example, members may be assigned to NAICS 562111, 562112, 562119 and/or 562219 (respectively *Solid Waste Collection, Hazardous Waste Collection, Other Nonhazardous Treatment and Disposal* and *All Other Miscellaneous Waste Management*) of which the first three use \$12.5 million in gross receipts as the size standard and the last, \$7 million, meaning that a company would be considered a "small business" if their average annual gross receipts does not exceed \$12.5, or \$7 million, for the past three years.

Because DSM did not collect gross receipt information from most CAER members surveyed, this could not be used as an indicator of size. Therefore, DSM used a combination of employment, number of locations and total payroll to classify surveyed companies as large or small.

In the absence of a clear size standard, DSM defined *large* as surveyed companies with a payroll greater than \$5 million and/or employment greater than 100, while those companies defined as small were assumed to have 100 or fewer employees and no more than two locations.

Once the surveyed companies had been divided into large and small companies, then average employment, payroll and throughput coefficients were calculated for each size. These coefficients formed the basis for estimating employment and payroll at non-responding *large* and *small* CAER member companies, by location.

Because DSM did not have employment data for most non-responding CAER members, DSM used location counts and available CAER member data to segregate non-respondents by size.

Table 3 presents total CAER member company and location counts and the count for members surveyed (by company and location). As Table 3 illustrates, DSM obtained surveys from 31

percent of CAER members, representing 55 percent of CAER member facilities or locations.

Table 4 then presents the results of calculating the average payroll, employee count and throughput per location for large and small sized companies.

The coefficients presented in Table 4 (per location coefficient) are then used to extrapolate the results from surveyed facilities to the total CAER membership facilities, which are presented in Table 5. This extrapolation is done for those locations that did not respond to the survey (the “No Data” column in Table 3) by multiplying the average results in Table 4 for large and for small companies by the number of locations for large and for small companies not responding. These modeled results are then added to the aggregated survey results and shown in Table 5 to estimate the total employment, payroll and throughput for all 163 locations operated by CAER members.

As illustrated by Table 5, DSM estimates that ***CAER members recycled nearly 1.2 billion pounds of electronics last year, employing roughly 6,850 people in the United States at an estimated payroll of \$251 million***

⁵ (continued) Other electronic recyclers may be assigned to NAICS 562920, *Materials Recovery Facilities* which has a size standard of \$12.5 million in gross receipts or NAICS 423930, *Recyclable Material Merchant Wholesalers* which has a size standard of 100 employees.



Table 3: CAER Membership, Sample Size and Missing Data to be Modeled

| Size Class | Total CAER Members | | Surveyed Members | | No Data | |
|---------------|--------------------|-----------|------------------|-----------|-----------|-----------|
| | Companies | Locations | Companies | Locations | Companies | Locations |
| Large | 17 | 105 | 10 | 76 | 7 | 29 |
| Small | 50 | 58 | 11 | 13 | 39 | 45 |
| Total: | 67 | 163 | 21 | 89 | 46 | 74 |

Table 4: Average Annual Payroll, Employee Count and Throughput for Surveyed Large and Small CAER Member Companies, By Facility/Location

| Size Class | Average Per Location | | |
|--------------|----------------------|-------------------|---------------------|
| | Payroll (\$) | Employees (FTE's) | Throughput (pounds) |
| Large | 1,945,281 | 53 | 8,600,411 |
| Small | 812,395 | 23 | 4,741,279 |

Table 5: CAER Survey Results Extrapolated to Total CAER Membership Facilities (Estimated Jobs, Payroll and Throughput, 2011)

| Categories | CAER Membership | | Employees | | Total |
|---------------|-----------------|------------|----------------|--------------|--------------|
| | Companies | Locations | Survey Results | Extrapolated | |
| Large | 17 | 105 | 4,004 | 1,528 | 5,532 |
| Small | 50 | 58 | 296 | 1,025 | 1,321 |
| Total: | 67 | 163 | 4,300 | 2,553 | 6,853 |

| Categories | CAER Membership | | Payroll (\$ 1,000) | | Total |
|---------------|-----------------|------------|--------------------|-----------------|------------------|
| | Companies | Locations | Survey Results | Extrapolated | |
| Large | 17 | 105 | \$147,841 | \$56,413 | \$204,254 |
| Small | 50 | 58 | \$10,561 | \$36,558 | \$47,119 |
| Total: | 67 | 163 | \$158,402 | \$92,971 | \$251,373 |

| Categories | CAER Membership | | Throughput (1,000 Lbs) | | Total |
|---------------|-----------------|------------|------------------------|----------------|------------------|
| | Companies | Locations | Survey Results | Extrapolated | |
| Large | 17 | 105 | 653,631 | 249,412 | 903,043 |
| Small | 50 | 58 | 61,637 | 213,358 | 274,994 |
| Total: | 67 | 163 | 715,268 | 462,769 | 1,178,037 |

Potential Increase in Jobs

The purpose of this analysis is to provide CAER members with a way to assess how many more jobs might be created in the US if a ban on the export of unprocessed e-waste were in place. In its simplest form, the statement can be made that, based on DSM's estimates of the total throughput and employment of CAER's membership, a new job would be created for every additional 172,000 pounds of e-waste processed in the United States.⁷ This estimate represents only those jobs directly involved in processing the additional e-waste. Additional indirect and induced jobs generated by the expenditure of wages associated with the new direct jobs in e-waste recycling would also be created. Typically indirect and induced jobs double the amount of direct jobs created.

The estimate of the potential creation of direct jobs is based on the following important assumptions:

- The mix of e-waste processed in the US under a ban on export would be similar to the mix of e-waste currently being processed by CAER members;
- The relative mix of large and small companies processing the additional e-waste would resemble that of the current CAER membership; and,

- Smelting of shredded circuit boards and other precious metal rich materials would continue to occur primarily outside of the US, as would recycling of significant quantities of CRT glass.

Potential Total Job Creation

Estimating the total number of new jobs associated with a ban on the export of unprocessed e-waste is significantly more difficult than simply quantifying the potential job creation associated with every additional million pounds of e-waste processed in the US. This is because there is no generally agreed upon, independent source of data on the generation, recovery and export of e-waste in/from the United States.⁸

For example, the Electronics Take Back Coalition states that "Recycling industry leaders estimate that 50% - 80% of all electronic waste collected in the US for recycling is not really recycled at all, but is exported via container ship to developing countries"; while a recent ISRI study (2011) reported that 70% of e-waste was recycled in the US.

To begin to quantify potential job creation, DSM conducted a literature search in an attempt to find credible data on the generation and recycling of e-waste in the US.

⁷ CAER membership's estimated annual throughput of 1.178 billion pounds divided by estimated employment of 6,853 persons (Table 5) equals an average of 171,903 pounds handled per employee. This is different from the figures in Table 2 which is based on the weighted average among companies surveyed but not the entire CAER membership.

⁸ See for example, *Characterization of Transboundary Flows of Used Electronics: Summary Report*, Miller, TR, et al, Massachusetts Institute of Technology and J. Linnell, National Center for Electronics Recycling, January, 2012.



DSM reviewed the September 2011 survey sponsored by the Institute of Scrap Metal Recyclers (ISRI), *eWaste and Environmental Opportunities Survey*, which concluded that 3.5 million tons of electronics were treated by the recycling industry in the US in 2010 and that 70 percent were processed domestically (or 4.9 billion pounds).⁹

DSM also reviewed estimates made by the US EPA, including those researchers supported by US EPA.

Based on a review of these two reports as well as other available literature it is DSM’s opinion that the US EPA funded report, *Characterizing Transboundary Flows of Used Electronics, 2012* represents the most credible data on potential generation of e-waste in the US.

Figure 8 of that report presents an estimate of roughly 2.4 million tons of e-waste generation in 2010 in the US, or 4.8 billion pounds (see Figure 2).

Assuming that CAER members processed 1.2 billion pounds of material in 2011, the US EPA funded report suggests that another 3.6 billion pounds of e-waste are being landfilled, processed by other domestic recycling companies or exported. This additional 3.6 billion pounds of e-waste represents a potential 21,000 full time equivalent recycling jobs with a corresponding payroll of \$772.9 million. Assuming a typical multiplier of 2, these direct recycling jobs would result in another 21,000 indirect and induced jobs, for a total of 42,000 jobs.

⁹ IDC (David Daoud). *Inside the US Electronics Industry*. IDC #229786, Volume: 1, eWaste and Environmental Opportunities: Survey. September 2011.

Figure 2: Quantity of Electronic Products Ready for End-of-life Management in the United States¹⁰ (Source: US EPA ORCR, 2011)

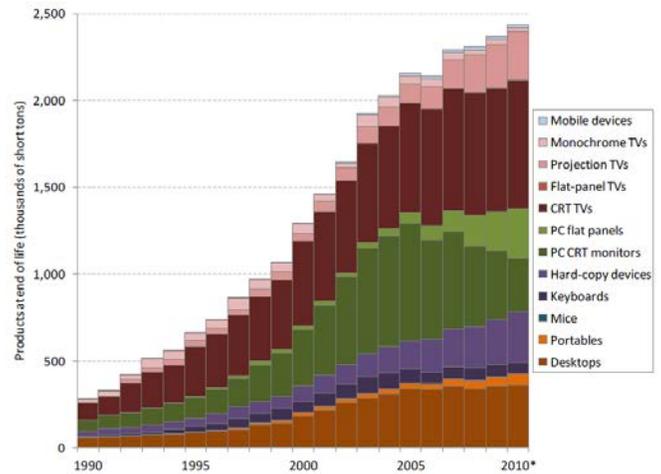


Figure 4: Quantity of electronic products ready for end-of-life management in the United States. *Results for 2010 are projected based on estimates from previous years.

Note: These are 2010 results based on estimates from previous years.

DSM recognizes that some of these recycling jobs already exist in non-CAER member companies, but also recognizes that a ban on export of untested electronics and on landfilling electronic waste would help to secure tens of thousands of newly created jobs in the US as well as more than \$1 billion of payroll.

In addition, the amount of jobs associated with recycling electronic waste in the US can be assumed to continue to increase as the amount electronic waste continues to rise. The US EPA estimates that electronic waste is growing 2-3 times faster than any other portion of the waste stream, as the use of electronic devices has rapidly increased over the past two decades, resulting in a large number of products reaching

¹⁰ Figure 8 from *Characterizing Transboundary Flows of Used Electronics: Summary Report*.

their end of life at a much faster rate than previously experienced.^{11, 12}

Finally, even if one were to accept the ISRI report¹³ estimate that 3.5 million tons were collected for recycling in the US (which is significantly higher than the current US EPA estimate), and that 70 percent was processed for recycling in the US, that would still leave 2 billion pounds that could be processed in the US, which would result in an estimated 12,200 new direct jobs with a payroll of \$448 million.

¹¹ See EPA Region 1 Website at:
<http://www.epa.gov/region1/solidwaste/electronic/index.html>

¹² Consumers Electronics Association. Market Research Reports: *Trends in CE Reuse, Recycle and Removal*. April 2008.

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Appendix

Survey Form: Jobs Through Electronics Recycling



COALITION FOR AMERICAN
ElectronicsRecycling

CAER Jobs Survey

Conducted by:



| COMPANY NAME AND CONTACT INFORMATION | |
|---|---|
| Company Name: _____ | Subsidiary of: _____ |
| Mailing Address: _____ | |
| City: _____ | State: _____ Zip: _____ |
| Contact Name: _____ | Title: _____ |
| E-mail address: _____ | Phone : _____ |
| Number of Locations: _____ | |
| Location(s) Represented by this Survey (Please list): _____ | |
| COMPANY WIDE DATA | |
| Total Employment (FTE's): _____ | Please list employment for all locations. |
| Total Annual Payroll (\$): _____ | Please list payroll for all locations. |
| Does this include benefits? Yes _____ No _____ | If No, what percent should be added for benefits? |
| Annual Lbs Processed: _____ | _____ % |

Please review the notes below before completing survey.

- 1) If you have more than one facility you can aggregate data for all of your facilities in the U.S. or you can complete the survey on the next page for each individual facility location.
- 2) We would like you to separate employees by activity type. For example, we would like to separate the number of employees and volume for asset recovery and IT asset disposition from those utilized for manual demanufacturing from those shredding or glass cleaning.
- 3) If you are uncertain as to the pounds by process, please make your best estimate based on percentage of throughput that goes through that process.
- 4) We understand that material may flow from one process to another. Please enter total input (company-wide) or by facility, and then throughput by operation so we can understand how much material is being double counted.
- 5) Please provide total full time equivalent (FTE) employment for your company. For payroll, please include company-wide payroll, including all benefits and administrative/management payroll. Please note whether you are including benefits in your total payroll calculation and if so, enter % above.

If questions on completing this form, please contact:

Natalie Starr 802.674.2840 x102 or Natalie@DSMEnvironmental.com

Ted Siegler 802.674.2840 x101 or Ted@DSMEnvironmental.com

If questions on the commissioning of this study, please contact those names below or a CAER board member:

Katie Reilly, Electronic Recyclers International kreilly@electronicrecyclers.com

Wendy Neu, Hugo Neu wneu@hugoneu.com

CAER JOBS SURVEY (Page 2)

IMPORTANT: This part of the survey can be completed for the entire firm or per location. Please specify on form whether this is for a single location or multiple locations, and please complete for each functional area.

Location (if not company-wide), and Total Employment at This Location

OPERATIONS/SERVICES PROVIDED

| Activity Type | Description | <i>Indicate if you provide this type of service with a "Yes" or "No."</i> | <i>Total Pounds, 2011</i> | <i>Pounds To Another Operation at This Location</i> | <i>Employment (FTE's)</i> |
|--|--|---|---------------------------|---|---------------------------|
| Administration and Management | Management, accounting, regulatory, commodity sales | | <i>Not applicable</i> | | |
| Asset Recovery and IT Asset Disposition | Certified data destruction and disposition of IT assets where recycler has capability to record make, model and serial number, etc. and refurbishment of equipment for resale. | | | | |
| Manual De-Manufacturing | Solely manual de-manufacturing of material. Companies that have hard drive shredding technology ONLY are included in this category. | | | | |
| Shredding Technology | Owns/operates shredding technology to shred electronic devices other than just hard drives. May include companies that have de-manufacturing facilities as well. | | | | |
| Glass Cleaning Technology | Owns and operates technology to clean glass down to the commodity level | | | | |
| Smelter/Refinery | Performs refining/smelting on site or at one of the company's locations. | | | | |
| Other Activities | Collectors, drivers and other functions not listed above (please list in this box) | | | | |
| Totals: | | | 100% | | |