Electronic Products Generation and Recycling in the United States, 2013 and 2014
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
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1.0 Background

U.S. Environmental Protection Agency's (EPA) Advancing Sustainable Materials Management: Facts and Figures report series[1] estimates the quantity of selected consumer electronic products ready for end-of-life (EOL) management and the quantity of those products collected for resale or materials recycling. This memo discusses how each of these metrics was estimated for data years 2013 and 2014.

Consumer electronic products included in the EPA report series are electronic products used in residences and commercial establishments such as businesses and institutions and are categorized as video, audio, and information products. Video products included cathode ray tubes (CRT) televisions (TV), and flat panel TVs, projection TVs, videocassette recorder (VCR) decks, camcorders, laserdisc players and digital versatile disc players (DVD). Audio products included rack audio systems, compact audio systems, portable compact discs (CD), portable headset audio, CD players, MP3 players and home radios. Information products included cordless/corded telephones, mobile telephones, telephone answering machines, facsimile (fax) machines, desktop and laptop computers, computer printers and other peripherals, computer monitors, tablets, eReaders, keyboards and mice. Certain other electronic products such as separate audio components were excluded because of limited data availability.

2.0 Revised Generation Methodology

The Sales Obsolescence Method (SOM) is a commonly used approach for estimating when a product sold in a given year will be ready for EOL management (generated), which means it is either ready to be collected by a used electronics processing organization for reuse (with or without refurbishing), materials recycling, combusted with energy recovery or sent to landfill.

In 2016, EPA revised the consumer electronic generation methodology based on research presented in the memorandum "Electronic Products Generation and Recycling Methodology Review" (EPA 2016). EPA compared 2015 methodology parameters to similar parameters used by the Solving the E-waste Problem (StEP) Initiative researchers. The StEP initiative is an international consortium of stakeholders created to address E-waste issues. The StEP initiative parameters were described in a published report.[2] Although both EPA (2015 and 2016) and StEP Initiative estimated generation by applying a SOM to historical

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[1] U.S. EPA. Advancing Sustainable Materials Management: Facts and Figures is located at https://www.epa.gov/smm/advancing-sustainable-materials-management-facts-and-figures-report

[2] Parameters used by the StEP Initiative and provided by the authors of: Duan, H., Miller, T.T., Gregory, J., Kirchain, R., Linnell, J. 2013. *Quantitative Characterization of Domestic and Transboundary Flows of Used Electronics Analysis of Generation, Collection, and Export in the United States.* MIT Materials Systems Laboratory (MIT MSL) and National Center for Electronics Recycling (NCER) under the umbrella of the StEP Initiative. This StEP Initiative report was preceded by a report characterizing various methods of flows of used electronics including generation, recovery and export (Miller, et al, 2012).

sales, they differed in the product lifespan probabilistic distribution methods and weight assumptions applied to the historical sales data. EPA's 2016 research showed that the probabilistic lifespan distribution method drives the results, which is especially true for electronic products with a rapid sales growth and commonly happens when new products or technologies are introduced to the market place. Differences in product weight assumptions between EPA and the StEP Initiative were not large enough to significantly alter the results.

Based on the previous research, EPA revised the lifespan probabilistic distribution from a uniform distribution (2015 EPA methodology) to a Weibull distribution (used by the StEP Initiative) for the following products: desktop and laptop computers, monitors, mobile phones, TVs, tablets and e-Readers. For the remaining products,[3,4] EPA used a uniform distribution for the 2013 and 2014 product generation estimates.

The simplest probabilistic distribution is a uniform distribution. The uniform distribution predicts that, for an electronic bought in a given year, it will be generated (reach EOL) at year three to year 11 from the date of purchase, and the same number of the electronic products would be generated annually in year three through 11 of its life. In other words, the same number (1/9 of the sales volume) of the electronic would be generated in each of those nine years. EPA uses uniform distributions to form its SOM for used electronic products based on combining estimates from published literature and Federal Electronics Challenge (FEC) participant input data. In practice, the method takes an average of the sales volume of an appropriate range of years prior to generation.

The Weibull distribution is shaped somewhat similarly to a lognormal distribution but has a different underlying meaning and different parameters (shape and scale versus mean and standard deviation). The Weibull distribution is typically employed to look at systems where there are components that fail or censor over a period of time. For example, a machine that breaks down is considered to have failed. A machine that doesn't break down is considered to be censored. Another application is where a patient that contracts a disease is considered to have failed and a patient who doesn't is considered censored. The Weibull distribution parameters (fail and censor) are well-suited for analyzing surveys of used electronics habits, assigning fail status to an electronic product generated for EOL management. A substantial benefit to fitting survey data to a Weibull distribution is that it can capture those electronics which were purchased in a given year, but not yet generated at the time of analysis (censored). Survey respondents were asked not only about the electronics they generated, but about electronics which they purchased but have not yet generated. One cannot know for certain which year into the future those electronics will be generated, but the analysis underlying a Weibull distribution can estimate it. For this reason, analyses resulting from Weibull distributions often predict longer lifespans than analyses based on generated electronics.

EPA applied the Weibull distribution to model the lifespan of residential used computers and computer monitors based on detailed, nationally representative surveys. Each device reported in the survey was

[3] VCR decks, camcorders, laserdisc players, digital versatile disc players (DVD), rack audio systems, compact audio systems, portable compact discs (CD), portable headsets, CD players, MP3 players, home radios, cordless/corded telephones, telephone answering machines, facsimile (fax) machines, computer printers and other peripherals, keyboards and mice.
[4] Weibull distribution could not be used for all products due to lack of data required by the distribution modeling.

coded as still owned by user ("censored") or no longer owned by user ("failed"). Statistical survival analysis was used to derive the Weibull distributions which modeled the lifespan of the other electronic products[5] based on published data (Babbitt, et al., 2011; Daniel, 2013; Pew, 2015).

2.1 Product Lifespan

Individuals have different habits with regard to their use and storage of electronics in their home or place of work, and each type of electronic remains useable for a different length of time. Due to the complexity of habits and electronics usability, instead of estimating an exact lifespan, a range of possible lifespans was estimated. The revised Weibull probability distributions used to represent this range are described in the next section.

2.2 Weibull Lifespan Probabilistic Distribution

The primary advantage of Weibull distribution is the ability to estimate, with reasonable accuracy, failure forecasts with extremely small samples (Abernethy, 2004). It is well-suited for analyzing surveys of used electronics habits, because a generated electronic is considered to have failed. EPA modeled the lifespan of residential used computers and computer monitors based on detailed, nationally representative surveys. One can also determine a best-fit Weibull distribution to data that are not derived from survival analysis of surveys. EPA fit Weibull distributions to the lifespan lengths and probabilities derived from literature for commercial computers (business/public), mobile phones, TVs, tablets and e-Readers.

Table 1 shows the Weibull lifespan parameters used by EPA for the products listed. The Weibull parameters, shape and scale define the distribution. A higher shape factor indicates that a product is more likely to fail as it ages, whereas a shape factor of one indicates a constant failure rate over time. The scale factor effectively stretches or compresses the probability distribution over time. A product with a higher scale factor is more likely to be generated at an older age than a product with a lower scale factor.

Table 1. Weibull Distribution Parameters

Generating Source	Weibull Parameters
Desktop Computers	
Residential Consumer	Shape:2.1, Scale:7.6
Business/Public	Shape:3, Scale:8.4
Laptop Computers	
Residential Consumer	Shape:1.7, Scale:13.3
Business/Public	Shape:2.9, Scale:9.2
CRT Monitor	
Residential Consumer	Shape:2.1, Scale:7.5
Business/Public	Shape:2.1, Scale:7.5
Flat Panel Monitor	
Residential Consumer	Shape:1.8, Scale:15.1
Business/Public	Shape:1.8, Scale:15.1
Mobile Phones	

[5] The other products include commercial computers (business/public), mobile phones, TVs, tablets and e-Readers.

Generating Source	Weibull Parameters
Residential Consumer	Shape:2.7, Scale:4.2
Business/Public	Shape:2.5, Scale:4
Televisions	
CRT	Shape:3.5, Scale:9.5
Flat Panel	Shape:3.5, Scale:7.5
Projection	Shape:3.5, Scale:7.5
Other Equipment	
Tablets	Shape: 2.0, Scale:2.5
e-Readers	Shape: 2.0, Scale:2.5

The Weibull lifespan distribution percentages applied to historical sales data are shown in Table 2.

Table 2. Weibull Lifespan Distribution Percentages*

Age of Product (years)	Desktop-Residential	Desktop-Commercial	Laptop-Residential	Laptop-Commercial	CRT Monitors	Flat Panel Monitors	Mobile Phones-Residential	Mobile Phones-Commercial	TV-CRT	TV- Flat Panel	TV-Projection	Tablets and e-Readers
1	3%	1%	2%	<1%	3%	1%	5%	8%	<1%	<1%	<1%	27%
2	6%	2%	3%	2%	6%	2%	16%	19%	1%	2%	2%	34%
3	9%	4%	4%	4%	9%	3%	24%	25%	2%	5%	5%	23%
4	10%	7%	5%	6%	11%	4%	25%	23%	4%	9%	9%	10%
5	11%	10%	5%	8%	12%	4%	17%	15%	7%	13%	13%	3%
6	12%	12%	6%	11%	12%	5%	9%	7%	10%	17%	17%	1%
7	11%	14%	6%	12%	11%	5%	3%	3%	12%	18%	18%	<1%
8	10%	13%	6%	12%	10%	5%	1%	1%	14%	16%	16%	<1%
9	8%	12%	6%	12%	8%	5%	<1%	<1%	14%	11%	11%	<1%
10	6%	9%	6%	10%	6%	5%		<1%	13%	6%	6%	
11	5%	7%	5%	8%	5%	5%		<1%	10%	3%	3%	
12	3%	4%	5%	6%	3%	5%			7%	1%	1%	
13	2%	2%	5%	4%	2%	5%			4%	<1%	<1%	
14	1%	1%	4%	2%	1%	5%			2%		<1%	
15	1%	<1%	4%	1%	1%	4%			1%		<1%	
16	1%	<1%	4%	1%	<1%	4%			<1%			
17	<1%	<1%	3%	<1%	<1%	4%						
18	<1%	<1%	3%	<1%	<1%	3%						
19	<1%	<1%	3%	<1%	<1%	3%						
20	<1%	<1%	2%	<1%	<1%	3%						
21			2%	<1%		3%						
22			2%	<1%		2%						
23			2%			2%						
24			2%			2%						
25 to 30			7%			6%						

*Temporary Diversion Primary and Secondary Use (includes storage)

2.3 Generation Results

The following table shows the 2013 and 2014 consumer electronics generation estimates. The Weibull distribution was used for computers, monitors, mobile phones, TVs, tablets and e-Readers. A uniform distribution was used for all other products.

Table 3. Consumer Electronic Products Generation Estimates 2013 and 2014

Products	Lifespan distribution	2013 Generation (tons)	2014 Generation (tons)
VCR decks, camcorders, laserdisc players, and DVD players, rack audio systems, compact audio systems, portable headsets, CD players, home radios, cordless/corded telephones, answering machines, fax machines, computer printers and other peripherals, keyboards, and mice	Uniform	940,000	920,000
Desktop and laptop computers, monitors, mobile phones, TVs, tablets and e-Readers.	Weibull	2,420,000	2,440,000
Total Products		**3,360,000**	**3,360,000**

3.0 Recycling

To estimate recycling of used electronic products in 2013 and 2014, EPA completed three separate data gathering efforts: (1) data collection from state agencies with mandatory reporting requirements; (2) small sample survey of key electronics recycling stakeholders operating in states with mandatory reporting; and (3) data review and collection from all 50 states and the District of Columbia environmental websites to estimate total recycling. As part of the first two data gathering efforts, EPA estimated the amount of recycled electronics processed by certified organizations.

3.1 State Electronic Product Recycling through Mandatory Reporting

As of 2015, 25 states and the District of Columbia had passed and implemented some type of electronics recycling legislation. For the data collection purposes, the laws resulted in regularly updated reporting on total weight of used electronics collected and recycled in the respective state. Reporting in these states was mandatory, and in some cases required identification of each recycler used to process the collected materials. For these reasons, this data gathering effort focused on the 25 states and the District of Columbia with used electronic product regulations in place.

As shown in Table 4 below, a total of roughly 366,000 tons were reported across 21 states in calendar year 2013 or the program year ending in 2013 (ERCC, 2014). In 2014, or the program year ending in 2014, the volume increased by 6% to almost 390,000 tons (CTA, 2015). The Table 4 data represent the mandatory data reporting. Some state reporting laws only included devices collected from households, while others included items collected from small to large businesses and institutions. Most states shown in Table 4 only required reporting of specific types of electronics covered under the legislation. Few states had data submission requirements for non-legislated electronic products collected and recycled

(mandatory or voluntary). EPA supplemented the mandatory data collection with additional research shown in Section 3.3 of this memorandum.

Table 4. Mandatory State Program Consumer Electronics Collection Data 2013 and 2014 (tons)

State	Total Reported Collected 2013	Total Reported Collected 2014	Percent Change 2013-14
California [1]	101,748	92,000	-10%
Connecticut	6,615	7,360	11%
Hawaii	2,070	2,118	2%
Illinois	23,581	21,772	-8%
Indiana	10,229	18,841	84%
Maine	4,092	4,239	4%
Michigan	15,087	16,337	8%
Minnesota [2]	16,150	17,800	10%
North Carolina	17,882	19,065	7%
New Jersey	19,300	23,150	20%
New York	49,751	48,378	-3%
Missouri	1,665	1,107	-33%
Oklahoma [3]	1,293	1,259	-3%
Oregon	13,864	13,715	-1%
Pennsylvania	21,758	31,200	43%
Texas	12,236	22,516	84%
Utah	3,800	4,270	12%
Vermont	2,439	2,444	0%
Virginia [3]	2,059	1,590	-23%
Washington	22,590	22,181	-2%
Wisconsin [2]	19,378	18,595	-4%
Total	365,734	389,937	6%

1 Tons claimed for payment to CalRecycle only, mostly CRTs

3.2 Recycled Electronic Products through Certified Organizations

Certification refers to the two certification programs launched in 2010 that provide electronics reuse and recycling organizations an accredited third-party auditing program to demonstrate that they meet certain standards for safely recycling and managing collected electronics.

The two accredited certification standards are 1) the Responsible Recycling (R2) Standard for Electronics Recyclers and 2) the e-Stewards® Standard for Responsible Recycling and Reuse of Electronics Equipment© (e-Stewards®). The R2 standard is managed by Sustainable Electronics Recycling

International (SERI), and the e-Stewards standard is managed by the Basel Action Network (BAN). According to EPA (EPA, 2014), both standards target:

- Reducing environmental and human health impacts from improper recycling
- Increasing access to quality reusable and refurbished equipment to those who need them
- Reducing energy use and other environmental impacts associated with mining and processing of virgin materials and conserving our limited natural resources

As part of the National Strategy for Electronics Stewardship (Interagency Task Force, 2011), EPA and other agencies have promoted the use of facilities certified to either or both of the R2 and e-Stewards standards (i.e., certified recyclers).

In order to estimate the quantity of electronic products recycled through certified organizations, EPA looked at several sources of existing data, surveyed a small sample of key electronics recycling stakeholders, and compared their estimates for the percentage of electronic processed by certified recyclers to 2013 and 2014 certified recycling estimates based on state data.

Some important caveats must be noted in examining certified recyclers and potential volumes managed at their facilities in 2013 and 2014. First, this analysis did not make a distinction between the two standards – some recyclers were certified to one or the other standard, and some were certified to both. For the purposes of this analysis, a "certified recycler" was any organization that has obtained a certification to either R2 or e-Stewards certifying body. Second, certification under these standards was facility-specific. Larger recyclers that have multiple facilities in several states might or might not have had all of their facilities certified to at least one of the certification standards. The standards have different policies regarding multi-facility organizations. The certified recycler processing estimates in this analysis assumed that a certified recycler with more than one location had certified all facilities. Finally, because this analysis examined calendar year 2013, the certifications under consideration were R2:2008 and e-Stewards version 1.0. Both SERI and BAN announced updated versions of the standards in 2013 and phased out earlier versions of the standards in 2014 and 2015.

There are several limitations to note when examining the state-reported data as the basis for estimating the quantity of recycled electronic products processed by certified organizations. First, the reporting requirements varied from state to state in terms of which entity was required to report (manufacturer, recycler, etc.), which could have resulted in over- or under-reporting depending on who was required to report. Second, some state reporting laws only included devices collected from households, while others included items collected from small to large businesses and institutions. Finally, most states only required reporting of specific types of electronics covered under the legislation, leading to inconsistencies and undercounting in the quantities reported by different states. Few states had data submission requirements for non-legislated electronic products collected and recycled (mandatory or voluntary).

State data provided a helpful breakdown of recycled electronic products sent to certified versus non-certified recyclers if the state reported amounts sent to individual recyclers. A list of recyclers was matched to the official lists of certified recyclers maintained by SERI and e-Stewards. EPA completed an analysis of the total tons reported in California, Connecticut, and Washington in 2013 and 2014 (Table 5). The state-reported totals by recycler were matched against recycler certifications to develop the overall percentages. The three states were chosen to represent a mix of generating sectors. California included

generation from all households and businesses, Connecticut covered household devices only and Washington reported recycling from households and small organizations (National Center for Electronics Recycling (NCER), 2015).

Table 5. Used Electronic Products Recycled/Claimed by Certified Recyclers 2013 and 2014

State	Total Reported 2013 (tons)	Percent Certified 2013	Total Reported 2014 (tons)	Percent Certified 2014
California	101,748	78%	92,000	81%
Connecticut	6,615	100%	7,360	72%*
Washington	22,590	83%	22,181	79%

*The decline in the volume sent to certified facilities under the Connecticut law can be attributed to the addition of one "Covered Electronic Recycler" not certified to either R2 or e-Stewards (Take 2), which received 28% of the total volume from collectors in 2014. CER are approved by the Connecticut Department of Energy and Environmental Protection (DEEP) through a process specified in regulations, but are not required to be certified.
Source: (NCER, 2015)

Manufacturer programs were also beginning to report on the total volume sent to certified recyclers. Participants in EPA's Sustainable Materials Management (SMM) Electronics Challenge, including original electronics manufacturers (OEMs), brand owners and retailers, reported their collection efforts annually. SMM Electronics Challenge participants collected more than 243,000 tons of used electronics in 2013, 99.6% of which was sent to certified recyclers. In 2014, they collected over 224,000 tons of used electronics and sent 99.7% to certified recyclers. The Consumer Technology Association (CTA) also reported member collection efforts through the eCycling Leadership Initiative. In 2013 and 2014, 99.9% of used electronics collected by eCycling Leadership Initiative participants were sent to certified recyclers (over 310,000 tons in 2013 and 330,000 tons in 2014). The data reported through EPA's SMM Electronics Challenge and CTA's eCycling Leadership Initiative had significant overlap with each other and with state-reported data, thus they could not be added to the state data reported above.

EPA contacted a limited number of representatives within the electronics recycling community for their perspectives on electronic product recycling through certified and non-certified organizations. The following questions were used to gain insight into the prevalence of certified electronics recyclers and the volumes processed:

- What percentage of e-scrap recycling firms are certified (R2 and/or e-Stewards)?
- What would you estimate is the volume (by percentage or total lbs/tons) of e-scrap going to certified (R2 and/or e-Stewards) firms vs. non-certified firms?
- Is there a difference between e-scrap coming from residential vs. commercial sources in terms of whether it ends up at certified vs. non-certified firms?
- Are some used products more likely than others to end up at certified vs. non-certified firms?

Survey respondents were chosen to be reflective of the industry overall, as well as certification programs. Because the existing state data were weighted heavily towards household/consumer recycling, a few representatives of the IT Asset Disposition (ITAD) side of the electronics recycling industry were chosen

to be interviewed. ITAD companies were those organizations who focus on recovering higher value IT devices from business users to refurbish and resell. Respondents fell into the following general categories.

- Industry Expert
- Auditing Consultant (all recyclers)
- Certification Programs
- ITAD: recycler and ITAD industry expert
- General recycler (small and large)

Each of the participants was asked to give their subjective estimate based on their knowledge of the current market. Some participants chose to not provide specific numbers with regards to their assumptions on the percentage of facilities or volume certified.

Table 6. Survey Responses on Questions Related to Certification

Question	Responses
% of Recycling Firms Certified	25%-80% (average 50-60%)
% Volume to Certified Firms	30-75% (average 50-60%)

Finally, participants were asked if the type of product being recycled plays a factor in whether it ends up at a certified recycler. Most agreed that difficult to recycle, low value products such as CRTs were likely going to certified recyclers. On the other side, some pointed out that cell phones may have a lower rate of recycling through certified recyclers since the companies that specialize in phone refurbishment and resale were not early adopters of certification.

The 2014 survey represented the second time participants were asked these questions. The majority of the respondents reported that their answers for 2014 would be the same as for 2013, with some incremental increases in the numbers of recycler facilities being certified, and therefore volume processed by certified recyclers. None of the participants who provided an updated response for 2014 indicated that a lower volume would be sent to certified facilities in that year. A few noted that there might be more substantial changes if the questions were posed for 2015 as significant decreases in the commodity prices from used electronics were only starting to be felt in late 2014. This also had the effect, according to one survey participant, of encouraging “some good recyclers doing bad things under the current financial and economic pressures - this could lead to an eventual further shake-out of certified sites.” By 2015, a few large recyclers decided to withdraw from one of the certification programs instead of remaining certified to both.

Table 7. Certified Recycling of Collected Electronics from State Data and Recycling Industry Survey

Source	% Certified 2013	% Certified 2014	Notes
State Data (Table 5)	78-100%	72-81%	Can include business recovery, but mainly household collections
Survey Responses (volume estimate) (Table 6)	30-75%	30-75%	Includes assumptions for business and household; For 2014, individual estimates increased, but still fell within the original range.
CEA eCycling Leadership	99.9%	99.9%	Mainly household collections

Using the overall estimate of the amount collected in 2013 of 1,270,000 tons (EPA, 2015), it was estimated that between 381,000 - 952,500 tons were sent to certified recyclers in 2013 (30-75%). For 2014, using the overall estimate of 1,400,000 tons collected (see Table 8), it was estimated that 420,000 – 1,050,000 tons were sent to certified recyclers (30-75%).

3.3 Total Recycling

To supplement the state data shown in Table 4, EPA researched all states' and the District of Columbia environmental websites for published electronic product recycling data. Any data found was compared to the state reported data shown in Table 4. As mentioned in section 3.2, most states only require reporting of specific types of electronics covered under the legislation, leading to potential undercounting of recycled products. For example, Oregon's annual recycling report showed 22,344 tons of electronics recycled in 2014 compared to under 14,000 tons shown in Table 4 (Oregon, 2015).

California has two state agencies with used electronic reporting requirements. CalRecycle requires extensive reporting of products covered by the Covered Electronic Waste (CEW) Payment System law (mainly TVs, monitors and other video displays) (data shown in Table 4). The California Department of Toxic Substances Control (DTSC) requires "handlers" of Universal Waste to report quantities of non-covered electronics collected. The 2014 DTSC data were not available. Therefore, EPA used DTSC 2013 data to represent 2014. The DTSC 2013 data were added to the CalRecycle 2014 data for total California recycling.

The methodology for estimating electronics recycling follows the methodology used in the EPA report "Electronics Waste Management in the United States Through 2009" May 2011. State level data collected from 36 state agency websites represented about 81 percent of the U.S. population in 2014. To fill in the two data gaps (1) states without data and (2) commercial recycling missed from the states' reporting mechanism, similar assumptions used in the May 2011 report were applied. Per capita factors developed from available data applied to population in states without data were used to estimate recycling in states where data were not identified.

The assumption to estimate the commercial recycling missed by the states' data collection efforts was that commercial recycling accounts for 67 percent of total recycling. This assumption was applied to the states' residential data to estimate commercial recycling (i.e., residential

recycling/.33 – residential recycling = commercial recycling). Total consumer electronic product recycling, estimated at 1.4 million tons, is shown in Table 8.

Table 8. State Program Consumer Electronics Collection Data 2014[1,2]

State	Data Year	Recycling (tons)
Alaska	2013	24
Arkansas	2014	2,900
California	2014	177,000
Colorado	2014	23,700
Connecticut	2014	7,400
Delaware	2013	2,600
Hawaii	2014	2,300
Illinois	2014	21,800
Indiana	2014	18,800
Kansas	2014	400
Kentucky	2014	2,900
Maine	2014	4,200
Maryland	2013	17,000
Massachusetts	2014	10,800
Michigan	2014	16,300
Minnesota	2014	17,800
Mississippi	2013	24
Missouri	2014	1,100
Nevada	2014	7,700
New Jersey	2014	23,200
New York	2014	48,400
North Carolina	2014	19,100
Ohio	2014	7,200
Oklahoma	2014	1,300
Oregon	2014	22,300
Pennsylvania	2014	31,200
Rhode Island	2014	2,600
South Carolina	2014	9,700
Tennessee	2014	2,300
Texas	2014	22,500
Utah	2014	4,300
Vermont	2014	2,400
Virginia	2014	1,600
Washington	2014	22,200
West Virginia	2014	1,300
Wisconsin	2014	18,600
Alabama	estimated	13,100
Arizona	estimated	18,300
District of Columbia	estimated	1,800
Florida	estimated	53,900

State	Data Year	Recycling (tons)
Georgia	estimated	27,400
Idaho	estimated	4,400
Iowa	estimated	8,400
Louisiana	estimated	12,600
Montana	estimated	2,800
Nebraska	estimated	5,100
New Hampshire	estimated	8,300
New Mexico	estimated	5,700
North Dakota	estimated	2,000
South Dakota	estimated	2,300
Wyoming	estimated	1,600
Commercial recycling adjustment[3]	estimated	657,400
Total recycling		**1,400,000**

[1] Mandatory and voluntary reporting
[2] States with no data reported were estimated from per capita rates developed from states with data reported.
[3] Some states capture commercial recycling (e.g., California). To estimate commercial recycling in those states not capturing commercial recycling, it was assumed that the data reported represented residential sources at 33% of the total.

Table 9 shows the total 2013 and 2014 U.S. recycling as a percentage of generation. Consumer electronics recycling was estimated at 37.8 percent in 2013, increasing to 41.7 percent in 2014.

Table 9. Total U.S. Recycling as a Percentage of Generation 2013 and 2014

Products	Lifespan distribution	2013 Generation (tons)	2013 Recycling (tons)	2014 Generation (tons)	2014 Recycling (tons)
VCR decks, camcorders, laserdisc players, and DVD players, rack audio systems, compact audio systems, portable headsets, CD players, home radios, cordless/corded telephones, answering machines, fax machines, computer printers and other peripherals, keyboards, and mice	Uniform	940,000		920,000	
Desktop and laptop computers, monitors, mobile phones, TVs, tablets and e-Readers.	Weibull	2,420,000		2,440,000	
Total Products		**3,360,000**	**1,270,000**	**3,360,000**	**1,400,000**
Recycling Rate			**37.8%**		**41.7%**

4.0 References

Generation

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