Reclay StewardEdge

Product Stewardship Solutions

# Recycling Refund System Cost Benefit Analysis

PREPARED BY: Reclay StewardEdge Inc.
FOR: the Minnesota Pollution Control Agency

**January 2014**

Reclay StewardEdge

Product Stewardship Solutions

*Cover photograph provided courtesy of Encorp Pacific (Canada).*

# Contents

# Executive Summary

This report presents the results of an evaluation of the costs and benefits of a recycling refund (commonly referred to as "bottle bill") policy approach to beverage container recycling in Minnesota. The recycling refund system that was investigated is different from any other like system operating in North America, especially U.S. deposit-return systems in the ten states with deposit-return programs. In particular, a key differentiator from other U.S. programs is the value of the deposit at ten cents, and the vision that the retail industry would have no obligation to accept returns or support redemption sites in the vicinity of retail establishments. These differences have had material impacts on the results of the analysis in this report, so that the costs and benefits results are not directly comparable to that of other deposit-return systems.

This study found that the recycling refund system described by the Minnesota Pollution Control Agency (MPCA) would result in increased recycling of approximately 107,000 tons of beverage containers in the state, or approximately 1.9 billion container units. In addition to the increase in quantity of beverage containers recycled, the quality of the collected commodities would be improved over that of the existing recycling systems.

Annual costs increases associated with achieving these higher recycling levels are estimated to be:

- $29 million to operate the recycling redemption system, incurred by beverage producers;
- Less than $1 million incurred by the State of Minnesota, not including state tax loss impacts that may occur from reduced in-state grocery sales;
- Undetermined costs incurred by consumers in transporting beverage containers to redemption sites.

The following annual cost reductions are also projected to result:

- $5.6 million realized by local authorities and individual single-family home waste and recycling service subscribers;[1] and
- Undetermined savings to state and local authorities for reduced litter cleanup.

Table 1 summarizes the primary revenue and cost line items associated with the $29 million net annual cost of operating the recycling redemption system.

**Table 1 Beverage Container Recycling Organization Financial Statement**

| | $ millions |
|---|---|
| **Revenues** | |
| Beverage Container Deposits Received | 469 |
| Sale of Processed Materials | 76 |
| *Subtotal Revenues* | *545* |

[1] Although impacts to industrial, commercial, institutional, and multi-family residential establishments could not be estimated in this study, it is reasonable to assume that the collective savings to these establishments would be marginally smaller than, although similar in magnitude to, that of single-family homes.

| | $ millions |
|---|---|
| **Expenses** | |
| Deposits Refunded | 395 |
| Redemption Center Payments | 141 |
| Collection Contractor Payments | 17 |
| Processor Payments | 14 |
| Materials (Pallets, Crates, Sacks) | 1 |
| Administration | 4 |
| Promotion and Education | 2 |
| *Subtotal Expenses* | *574* |
| **Operating Result** (annual deficit to be funded by beverage distributors) | **(29)** |

The recycling refund system is estimated to have the following Minnesota jobs impacts:

- Increases of:
  - 1,438 recycling refund system jobs;
  - 14 glass beneficiation jobs;
  - 4 state law enforcement and regulatory agency jobs; and
  - Undetermined potential for in-state recycling manufacturing jobs.
- Decreases of:
  - 214 supermarket and grocery jobs;
  - 39 beverage industry production and distribution jobs (note, jobs will be shifted to other states but are not forecasted to be actually lost);
  - 136 residential recycling collection jobs;
  - 6 waste collection and landfilling jobs.

The total job impact is forecasted to be a net gain of 1,064 jobs.

In addition to the above benefits, energy savings and environmental quality benefits would occur from the recycling redemption program. It was beyond the scope of this report to estimate these benefits.

# 1. Introduction

In its 2007 Solid Waste Policy Report, the MPCA recommended the establishment of a goal to recycle 80 percent of beverage containers by January 1, 2012. Estimates made by Reclay StewardEdge (RSE), the contractor for this study, indicate that approximately 45 percent of beverage containers may be recycled in the state. Clearly, the 80 percent goal has not been achieved through the existing approach to recycling in Minnesota; therefore, MPCA commissioned this report to investigate the costs and benefits of a recycling refund policy approach to beverage container recycling.

This report provides estimates for the:

- Increase in the beverage container recycling rate if a recycling refund system were implemented in Minnesota in parallel to the existing infrastructure for packaging recycling in the state;
- Additional costs associated with a recycling refund system;
- Financial impact to local authorities and individual household subscribers from diverting beverage containers from the existing single-family residential waste and recycling infrastructure to the recycling redemption system;
- Employment impacts to sectors of the state's economy that may be directly affected by a recycling refund system, including: beverage producers and distributors; grocery stores; waste and recycling collection, processing, and disposal establishments, and new recycling refund establishments; and
- Litter reduction.

## 1.1. Methodology and Approach

A consultative approach was used for preparing the estimates found in this final report. This approach included:

1) MPCA preparation of "Draft Program Design for a Recycling Refund Program for Beverage Containers in Minnesota," and a public meeting convened by MPCA for stakeholder comments on the document as well as the concept of a recycling refund system in Minnesota;
2) RSE review of comments submitted in response to the public meeting, with additional one-on-one follow-up interviews with selected stakeholders;
3) RSE review of an extensive number of existing data and reports with respect to recycling refund system cost and benefits;
4) RSE development of estimates for the costs and impacts of a recycling refund system in Minnesota, and preparation of a draft report;
5) MPCA release of the draft report for public review and comment, and a second public meeting at which stakeholders could ask questions and provide comments;
6) RSE preparation of a final report based on comments received;
7) MPCA preparation of a report and recommendations to the Minnesota State Legislature in January, 2014.

## 1.2. Summary of Existing Recycling Systems

Existing recycling systems in Minnesota do not target beverage containers for collection through beverage container-specific infrastructures. Instead they are managed through broad-based approaches to recycling discards, including:

- Municipally-provided or contracted residential recycling collection programs for household packaging and paper;
- Residential recycling collection services offered by private haulers to individual households in subscription locations;
- Residential recycling collection services offered by private haulers to property managers of multi-family residential properties, and to managers of industrial, commercial, and institutional (ICI) properties;
- Recovery of metal cans from municipal solid waste delivered to waste-to-energy facilities;
- Public spaces recycling collection programs provided by local authorities; and
- A beverage container recycling collection program sponsored by the Recycling Association of Minnesota (RAM) at selected venues in the state.

## 1.3. Description of Recycling Refund System

Estimates of the impacts of a recycling refund system in Minnesota that are provided in this report are highly sensitive to the details of how such a system may be structured and operate. Such details would depend on what may be authorized in prospective enabling legislation, and on decisions that may be made by the organization that would oversee the prospective recycling refund system. The details assumed in this report for how a prospective recycling refund system could be structured and operate are based on an MPCA document "Draft Program Design for a Recycling Refund Program for Beverage Containers in Minnesota," stakeholder comments, and RSE assumptions needed to model the cost, effectiveness, and impacts of one recycling refund system approach.

The recycling refund program evaluated in this report is assumed to have the following attributes:

- Recycling refund/deposit amount of $0.10 will apply to beverage containers up to one gallon to be paid at time of sale.
- Beverage containers subject to a deposit includes all alcoholic or a nonalcoholic drink containers intended for human consumption and packaged for sale in a redeemable beverage container including beer and other malt beverages, wine, distilled spirits regardless of dairy-derived content, carbonated and noncarbonated soft drinks, flavored and unflavored bottled water, fruit juice, milk, and tea and coffee drinks regardless of dairy-derived content.
- Exclusions to the program include the following:
  - A syrup, a liquid concentrate, a condiment, or any other additive intended primarily as a flavoring ingredient in food or beverage;
  - A liquid that is a drug, a medical food, or an infant formula as defined by the federal food, drug, and cosmetic act;
  - A liquid that is a dietary supplement as defined as a dietary supplement; and
  - A product frozen at the time of sale to the consumer.
- A non-profit beverage container recycling organization (BCRO) to manage the program will be created by statute. Responsibilities for the organization include:
  - Overall program management;
  - Development of the Beverage Container Recycling Plan;
  - Financial management of the program including determination of handling fees required to compensate independent operators of the system;
  - Maintenance of brand registry;
  - Selection, approval, and contracting with:

    - Operators of redemption locations to ensure their capability to meet convenience requirements, service standards, reporting requirements, and economies of scale for efficient operations;
    - Collection service providers to transport beverage containers redeemed at redemption locations to redemption container processors and glass container beneficiaries;
    - Redemption container processors who sort and bale redemption containers.
  - Marketing of redeemed beverage containers;
  - Annual reporting to the MPCA and the public; and
  - Annual third party financial audit of program finances.
- The Board of Directors of the BCRO will be appointed by the MPCA Commissioner and include representatives of the following:
  - Brand owners;
  - Distributors of beverages;
  - Local government; and
  - Redemption centers.
- The Beverage Container Recycling Plan will:
  - Identify collection centers to ensure the convenience requirement is met;
  - Determine amount for handling fees, to be paid to redemption centers;
  - Develop a strategy to ensure opportunity for recycling at public events;
  - Identify market development activities that may be needed to support end markets for redeemed containers;
  - Outline a strategy to prevent fraud; and
  - Include a communications/media plan.
- There will be a minimum of one redemption site per county up to 15,000 population, and one additional site for each additional 15,000 population or fraction thereof.
- Unredeemed deposits will remain with the beverage container recycling organization.
- Any redemption center handling fees necessary to support the operation of redemption centers will not be specified by legislation but will be determined by the beverage container recycling organization.
- Redemption centers may be operated by retailers (on a voluntary basis), local government, charitable/non-profit organizations, and solid waste facilities (such as materials recovery facilities or transfer stations). Centers can be either staffed or consist of a reverse vending machine. Retailers that sell containers that carry a deposit are not required to serve as redemption centers.
- Containers that are deposited in curbside/drop-off recycling containers or industrial, commercial, or Institutional (ICI) recycling containers can be redeemed by private haulers, materials recovery facilities, and sponsoring local governments – individual and whole containers collected in such manner must be separated from other recyclables collected and delivered to a redemption system processor. Such containers delivered will receive a full ten cent per container refund – redemption center handling fees, transportation cost reimbursement, or additional processing fees in excess of the deposit refund value will not be paid.
- The beverage container recycling organization will own and market all beverage containers returned for refund of the deposit.
- The beverage container recycling organization will be responsible for achieving and maintaining an 80 percent recycling rate.
- Unredeemed deposits will be managed by the beverage container recycling organization and be used to offset program costs.
- The program will create a fund for state market development activities to be managed by the beverage container recycling organization related to redeemable containers. Determinations as to necessary investments will reside with the beverage container recycling organization and must be addressed in the Beverage Container Recycling Plan.
- MPCA will be the primary oversight agency with responsibilities for reviewing and approving the beverage container recycling plan, ensuring compliance, providing technical assistance, conducting program evaluation, reporting to the Legislature, and conducting criminal investigations and enforcement actions related to fraud.

# 2. Existing Recycling Systems Performance

## 2.1. Beverage Container Generation and Recycling Data Availability

The amount of beverage containers generated can be estimated in one of two general ways: through annual surveys of distributors to gather sales data on a units or fluid volume basis, or by summing annual reported values for recycling and disposal quantities to arrive at a generation estimate. Table 2 summarizes data sources that were reviewed for use in this study, both in terms of estimating beverage container generation, as well as for estimating beverage container recycling quantities:

**Table 2 Data Sources for Existing Generation and Recycling Data**

| Data Source | Data Type | Notes |
|---|---|---|
| Governor's Select Committee on Recycling and Environment (SCORE), 2012 | Recycling | · Annual recycling tonnage estimates reported by county governments for all municipal and private sector recycling within the boundaries of the county<br>· Recycled quantities reported in broad categories – i.e., beverage container-specific quantities are not reported, including estimates by generating sector<br>· Counties may estimate quantities recycled by establishments that do not report their activities to the county |
| MPCA materials recovery facilities annual permit reporting, 2012 | Recycling | · Annual tonnages of recyclables shipped to market reported by materials recovery facilities<br>· Does not identify county of origin or generating sector<br>· Paper stock dealers and scrap metal processors are not required to report recycling quantities |
| "2013 Statewide Waste Characterization Study," Burns & McDonnell, Oct. 2013 | Disposal | · Tonnages of beverage containers sent to disposal facilities (landfills and waste-to-energy facilities |
| "Beverage Sales Market Data Analysis," Container Recycling Institute, 2010 | Generation | · Estimated beverage container sales in number of containers and tons, based on data from numerous sources, some of which provide state-level sales data |
| Alcoholic beverage sales data, Minnesota Department of Revenue | Generation | · Minnesota imposes excise taxes on beer, wine, and distilled spirits based on the volumes of beverage sold<br>· Volume data must be converted to units and tons of packaging using estimating factors in order to be of use<br>· Data is only available for alcoholic beverages |
| "Beverage Containers," MPCA, 2009 | Recycling, Generation | · Analyzed quality of data from various sources (including those listed in this table), included one-time estimate (2007/2008) of beverage container generation by Northbridge Environmental Management Consultants |

The last resource listed in Table 2 provided an evaluation of the various data sources, with the finding that each of the data sources has strengths and weaknesses, and further concluding that none of them by themselves adequately track beverage container recovery in Minnesota. While a one-time survey of industry sales data suggested a lower generation rate of beverage containers than Container Recycling Institute (CRI) estimates, inconsistencies in recycling and disposal quantity estimates over time and the fact that annual industry sales surveys are not performed, resulted in a decision to use CRI data, which are updated annually, as the basis of generation estimates used for this study.

CRI generation estimates were not used by this study exactly as provided. RSE adjusted the CRI estimate for gable top and aseptic cartons (i.e., milk and juice cartons) upward by 12 percent based on recycling and disposal quantity estimates from the other data sources that indicated higher generation rates in Minnesota than CRI's approach of apportioning national data based on state population. RSE also added an estimate for flavored and enhanced still water containers based on information supplied by CRI, which otherwise were not included in their estimates. Finally, RSE increased CRI's 2010 estimates by 1.4 percent to produce 2012 calendar year estimates, the most recent year that state recycling data was available.

## 2.2. Beverage Containers Collected for Recycling

As mentioned above, none of the recycling data reporting systems used in Minnesota gathers data on the amount of beverage containers recycled – beverage containers are grouped with non-beverage containers in the recycling data sets (e.g., PET recycling statistics include shampoo, dish soap, and salad dressing bottles in addition to beverage bottles, and glass recycling statistics include food jars in addition to beverage bottles). RSE estimated beverage container recycling quantities by subtracting 2012 disposal estimates from the Statewide Waste Characterization Study, which are generally beverage container specific, from the generation estimates for 2012, as discussed above.

One exception to the methodology for estimating recycling quantities was made for glass. The glass recycling quantity using this methodology resulted in a glass beverage bottle recycling rate higher than could reasonably be expected given the extent of the state's recycling collection infrastructure and typical recycling factors. The waste composition study estimates are based on a statistical analysis based on a limited number of field samples that are sorted and classified. Rather than use the sample mean as reported by the study, RSE used the upper limit, at a 90 percent confidence level, as the estimate for beverage containers disposed.

According to the Minnesota 2012 SCORE data, 22 percent of generated municipal solid waste (39 percent of non-recycled waste) goes to waste-to-energy and refuse-derived fuel plants located in the state. RSE reviewed information on these plants and identified the extent to which aluminum and steel cans are separated from the waste. The waste composition disposal estimates were adjusted by RSE to reflect additional recycling of metal beverage containers that results from the percentage of waste processed for energy production in the state. RSE's estimate of the existing level of beverage container recycling in Minnesota, both through source separated collection and separation from waste is shown in Table 3 below.

**Table 3 Estimates of Existing Beverage Container Generation and Recycling**

| Container Type | Generation (tons) | Collected in Recycling Programs[1] (tons) | Source Separated Recycling Rate | Separated From Waste[2] (tons) | Total Recycling (tons) | Total Recycling Rate |
|---|---|---|---|---|---|---|
| PET Bottles | 41,732 | 18,532 | 44% | 0 | 18,532 | 44% |
| HDPE Bottles | 9,878 | 4,698 | 48% | 0 | 4,698 | 48% |
| Other Plastic Bottles | 2,681 | 536 | 20% | 0 | 536 | 20% |
| Aluminum Cans | 32,087 | 14,737 | 46% | 2,249 | 16,986 | 53% |
| Steel Cans | 63 | 31 | 49% | 6 | 37 | 60% |
| Glass Bottles | 155,072 | 73,052 | 47% | 0 | 73,052 | 47% |
| Aseptic/Gable-top Cartons | 9,317 | 382 | 4% | 0 | 382 | 4% |
| Foil Pouches | 261 | 0 | 0% | 0 | 0 | 0% |
| **TOTAL** | **251,090** | **111,967** | **45%** | **2,255** | **114,222** | **45%** |

1 Includes residential, private ICI, and public spaces recycling collection programs.
2 Recovered from municipal solid waste sent to refuse-derived fuel and waste-to-energy plants.

## 2.3. Sector Generation and Recycling Estimates

An analysis of the impact of a recycling redemption program on local authorities was required in this report. In order to estimate this impact, it was necessary for RSE to prepare estimates of the quantities of beverage containers collected through municipally-funded residential recycling and waste collection/disposal programs, which are most commonly limited to waste and recyclables discarded by single-family homes, as opposed to beverage containers generated in ICI establishments and multi-family residences, where services for the management of discards are normally privately contracted.

RSE created a generation and recycling flow model for beverage containers in Minnesota for estimating generating sector quantities and impacts. The flow model is based on numerous inputs, including:

- CRI beverage container generation data (all sectors);
- Aluminum industry estimates of the amounts of aluminum cans generated in homes, in public spaces, and in ICI sectors;
- Glass Packaging Institute estimates of the quantities of glass generated in residences compared to on-premises (bars and restaurants);
- Recent waste composition studies from Hennepin County Minnesota, Wisconsin, and Illinois that had data on the relative disposal quantities of beverage containers in residential and ICI waste streams;
- RSE estimates of the relative split of beverage containers in residences between single-family and multi-family homes based on the percent of population in each type of residence, and assuming equivalent per capita consumption rates in each type of residence; and
- Additional estimates by RSE based on professional experience.

Table 4 shows the generation estimates by sector.

**Table 4 Estimates of Beverage Container Generation by Sector**

| Container Type | Single-family Residential (tons) | Multi-family Residential (tons) | Industrial/ Commercial/ Institutional (tons) | Public Spaces (tons) |
|---|---|---|---|---|
| PET Bottles | 20,782 | 4,257 | 15,023 | 1,669 |
| HDPE Bottles | 5,329 | 1,091 | 1,729 | 1,729 |
| Other Plastic Bottles | 1,113 | 228 | 1,206 | 134 |
| Aluminum Cans | 14,648 | 3,000 | 12,995 | 1,444 |
| Steel Cans | 29 | 6 | 25 | 3 |
| Glass Bottles | 104,255 | 21,353 | 27,991 | 1,473 |
| Aseptic/Gable-top Cartons | 4,408 | 903 | 601 | 3,405 |
| Foil Pouches | 43 | 9 | 188 | 21 |
| **TOTAL** | **150,606** | **30,847** | **59,758** | **9,878** |
| **Sector portion of generation** | **60%** | **12%** | **24%** | **4%** |

Table 5 shows existing recycling estimates by generating sector.

**Table 5 Estimates of Existing Beverage Container Collection for Recycling[1]**

| Container Type | Single-family Residential (tons) | Multi-family Residential (tons) | Industrial/ Commercial/ Institutional (tons) | Public Spaces (tons) |
|---|---|---|---|---|
| PET Bottles | 10,190 | 2,087 | 5,587 | 668 |
| HDPE Bottles | 3,038 | 622 | 346 | 691 |
| Other Plastic Bottles | 357 | 73 | 95 | 10 |
| Aluminum Cans | 7,438 | 1,523 | 5,198 | 578 |
| Steel Cans | 19 | 4 | 7 | 1 |
| Glass Bottles | 52,942 | 10,844 | 8,677 | 589 |
| Aseptic/Gable-top Cartons | 181 | 37 | 25 | 140 |
| Foil Pouches | 0 | 0 | 0 | 0 |
| **TOTAL** | 74,165 | 15,190 | 19,935 | 2,677 |
| **Sector portion of collection** | 66% | 14% | 18% | 2% |

1 Recycling tonnages are from source-separated recycling collection programs, and do not include additional recycling quantities of metal cans from waste sent to refuse-derived fuel and waste-to-energy plants.

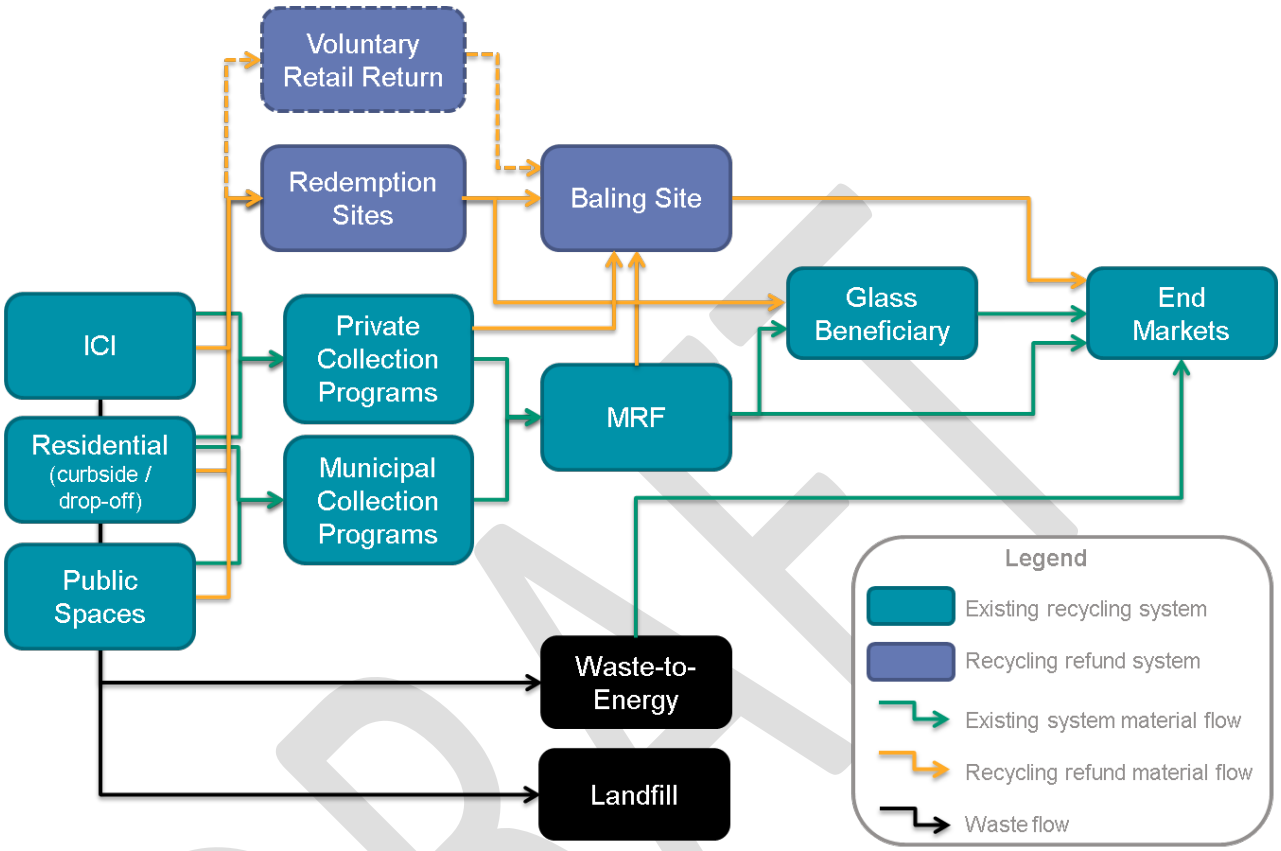
Based on the recycling and generation estimates of Table 4 and Table 5, our analysis indicates that enhancements to only the residential recycling collection infrastructure, such as expanding residential collection access or making participation more convenient through single-stream recycling, will not result in an 80 percent beverage container recycling rate. Either investments in an extensive expansion of beverage container recycling collection in all generating locations including public buildings and spaces; industrial, commercial, and institutional properties; and comprehensive residential collection, supported by other policies and promotion and education, would be required. Alternatively, direct incentives such as are offered through a recycling refund program, can be considered as well. The following section presents estimates for the performance and costs of a recycling refund system in Minnesota.

# 3. Recycling Refund System Performance and Costs

## 3.1. Materials and Financial Flows

Figure 1 shows the flow of beverage containers to recycling and disposal facilities, with the recycling refund system as the primary mechanism for beverage container collection, supplemented by municipal and private recycling collection programs, with some final recovery of metal cans at waste-to-energy facilities.

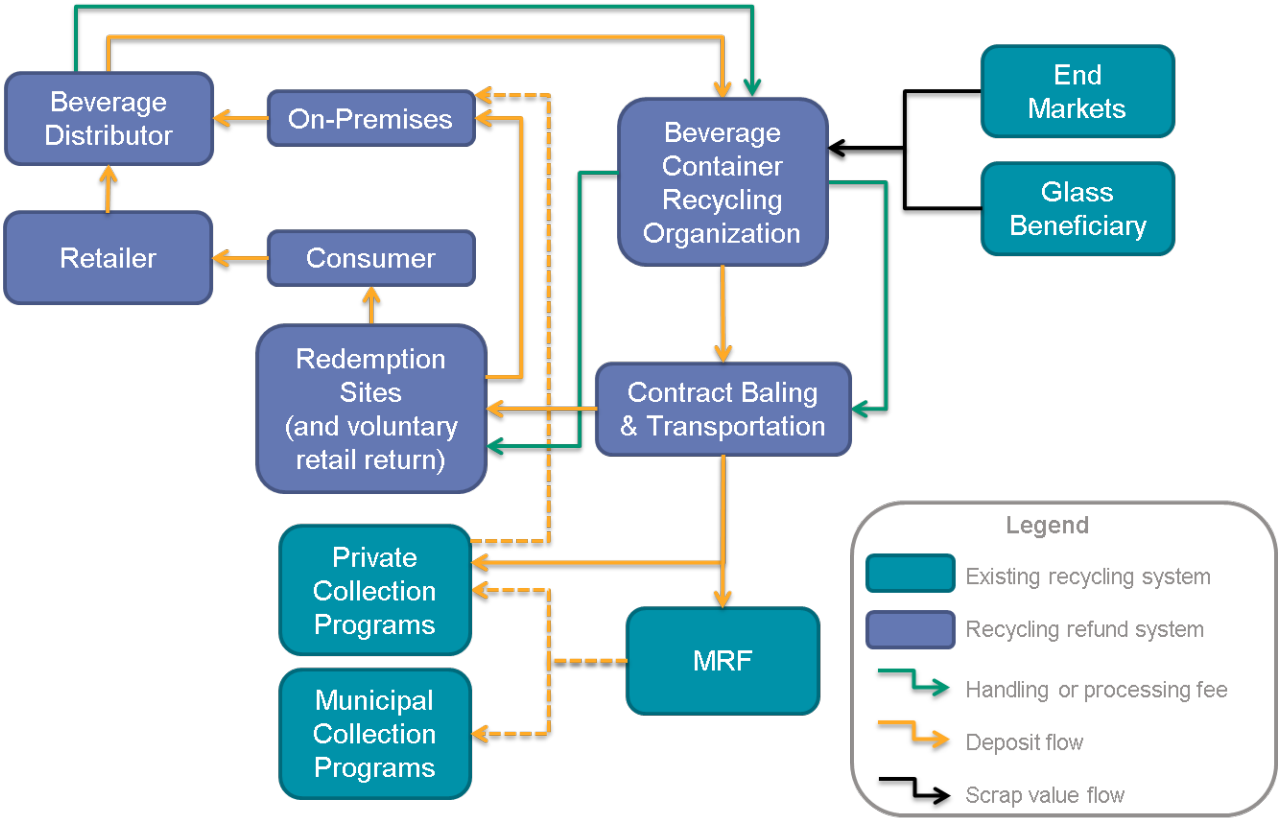
**Figure 1 Recycling Refund System and Existing System Materials Flows**




The analysis conducted for this study has assumed that all recycling refund system operations will be performed by independent for-profit contractors, including the operation of redemption centers, sorting/baling at recycling refund system processing locations, and transportation of collected beverage containers from redemption sites to sorting/baling locations (omitted from Figure 1Figure 1 to allow a clearer portrayal of the main system participants). The profit margin for these for-profit contractors has been included in the financial analysis in this report.

As Figure 1 shows, the existing recycling system will connect to the recycling refund system in that materials recovery facilities (MRFs) will be allowed to separate out beverage containers from mixed recyclables and deliver them to contract recycling refund system baling facilities for a full deposit refund – beverage containers delivered must be sorted by material type and delivered loose for inspection by recycling refund baling sites to ensure the containers are beverage containers only. In return, they will be provided with a full refund of the deposit collected; however, they will not be entitled to payment of handling fees, which only redemption sites and voluntary retail return locations will be entitled to receive. Like materials recovery facilities, private collectors such as non-profit groups will be allowed to register with the beverage container recycling organization, accept donations of beverage containers, and deliver loose beverage containers sorted by material type with the same compensation arrangement provided to materials recovery facilities (full deposit value, no handling fee payment). These financial flows are illustrated in Figure 2.

**Figure 2 Recycling Refund System Financial Flows**




The dotted lines shown in Figure 2 represent negotiated sharing of refunded deposits between materials recovery facilities, municipal collection programs, and private collectors who may deliver loads of mixed recyclables (including beverage containers) to materials recovery facilities for sorting. The beverage container recycling organization will finance the cost of operating the recycling refund system from unredeemed deposits, the sale of beverage containers processed by contract baling establishments operating on its behalf, and by collecting supplemental fees as necessary from beverage distributors to the extent that supplemental fees are needed to ensure the recycling refund system does not operate at a permanent year-over-year deficit. Because redemption sites will be eligible for receiving payments of handling fees, whereas private materials recovery facilities and collectors will not, we estimate that large redemption sites will collect beverage containers generated on-premises at bars, restaurants, and schools (e.g., school milk cartons) as part of the service that they provide to residents and businesses in the vicinity of their sites.

## 3.2. Beverage Container Recycling Quantities

### 3.2.1. Recycling Refund System Returns

RSE created a model for the operation of the recycling refund system in Minnesota in parallel to the existing recycling infrastructure described previously in Section 3. The model includes separate return rates for beverage containers generated in residential, ICI, and public spaces generating sectors, with the highest

return rated coming from the residential generating sector. Because of the ten cent deposit, however, the majority of beverage containers collected for recycling from all generating sectors are estimated to be collected through the recycling refund system rather than the existing recycling systems. The model also includes estimates of the quantities of beverage containers that may be separated by materials recovery facilities, whether from residential or private ICI collection programs, for the value of the deposit.

Table 6 presents estimates of the quantities of beverage containers managed by the recycling refund system, broken into collection by redemption centers (including voluntary retail return) and collection/separation from other recyclables by materials recovery facilities and other recyclers or non-profits. All the beverage containers listed in Table 6 will result in a full ten cent per container deposit return.

**Table 6 Estimates of Beverage Containers Managed by the Recycling Refund System**

| Container Type | Collected by Redemption Centers | | | Collected by MRFs/Others | | Total Marketed by Recycling Refund System | | |
|---|---|---|---|---|---|---|---|---|
| | tons | million units | redemption rate[1] | tons | million units | tons | million units | refund total[1] |
| PET Bottles | 29,229 | 913 | 70% | 4,837 | 151 | 34,066 | 1,064 | 82% |
| HDPE Bottles | 7,144 | 97 | 72% | 1,096 | 15 | 8,240 | 112 | 83% |
| Other Plastic Bottles | 349 | 5 | 13% | 397 | 5 | 745 | 10 | 28% |
| Aluminum Cans | 26,461 | 1,817 | 82% | 2,429 | 167 | 28,890 | 1,984 | 90% |
| Steel Cans | 45 | 1 | 72% | 0 | 0 | 45 | 1 | 72% |
| Glass Bottles | 130,043 | 463 | 84% | 1,731 | 6 | 131,774 | 469 | 85% |
| Aseptic/Gable-top Cartons | 6,625 | 279 | 71% | 99 | 4 | 6,724 | 283 | 72% |
| Foil Pouches | 117 | 30 | 45% | 0 | 0 | 117 | 30 | 45% |
| **TOTAL** | **200,013** | **3,604** | **77%** | **10,589** | **348** | **210,602** | **3,952** | **84%** |

1 Redemption rates are based on number of units returned. Calculations on a weight basis may yield different percentages.

Table 6 shows that an estimated 77 percent of beverage containers will be returned to redemption centers or will be collected by redemption centers from bars, restaurants, and schools. Redemption centers will receive handling fees for these estimated recovery quantities. An additional 7 percent of beverage containers will be separated from other recyclables by materials recovery facilities, private recyclers, or non-profits and delivered to recycling refund system materials recovery facilities, The total percentage of beverage containers that the recycling refund system is forecasted to take possession of and market is 84 percent of beverage containers generated. It should be noted that the relative quantity of beverage collected through redemption centers compared to multi-material recycling collection programs shown in Table 6 is similar to that of California's recycling redemption program, where approximately 8 percent of beverage containers were "returned" through curbside recycling programs in 2012.[2]

### 3.2.2. Recycling of Beverage Containers by Other Infrastructures

The estimated 77 percent of beverage containers that will be redeemed will be diverted from their existing flows, including disposal and recycling flows. Section 3 estimated that 45 percent of beverage containers are currently being recycled through municipal recycling collection programs, private recycling collection programs, and recovery of steel and aluminum cans from municipal solid waste sent to refuse-derived fuel and waste-to-energy plants. Table 7 shows estimates of beverage containers forecasted to be collected

[2] "California's Beverage Container Recycling & Litter Reduction Program Fact Sheet," California Environmental Protection Agency Department of Resources Recycling & Recovery, June 2013.

and recycled based on existing flows and the diversion of beverage containers from those flows through by the recycling refund system and the ability of materials recovery facilities to separate out beverage containers for the deposit value.

**Table 7 Estimates of Beverage Containers Managed by Other Recycling Infrastructures**

| Container Type | Received by MRFs/Others | | | Processed by RDF/WTE Plants | | Redemption Center | Total Statewide Recycling – All Infrastructures | |
|---|---|---|---|---|---|---|---|---|
| | received tons | redeemed tons | recycled tons | received tons | recycled tons | tons | tons | rate[1] |
| PET Bottles | 5,375 | 4,837 | 537 | 1,540 | 0 | 29,229 | 34,604 | 83% |
| HDPE Bottles | 1,217 | 1,096 | 122 | 328 | 0 | 7,144 | 8,361 | 85% |
| Other Plastic Bottles | 466 | 397 | 70 | 403 | 0 | 349 | 815 | 30% |
| Aluminum Cans | 2,479 | 2,429 | 50 | 680 | 408 | 26,461 | 29,348 | 91% |
| Steel Cans | 8 | 0 | 8 | 2 | 2 | 45 | 55 | 87% |
| Glass Bottles | 11,539 | 1,731 | 9,808 | 2,914 | 0 | 130,043 | 141,582 | 91% |
| Aseptic/Gable-top Cartons | 110 | 99 | 11 | 558 | 0 | 6,625 | 6,735 | 72% |
| Foil Pouches | 0 | 0 | 0 | 31 | 0 | 117 | 117 | 45% |
| **TOTAL** | **21,195** | **10,589** | **10,606** | **6,455** | **410** | **200,013** | **221,618** | **88%** |

1 Calculated on a weight basis – calculation based on units may yield different percentages.

As Table 7 shows, RSE has estimated that in most cases materials recovery facilities and other recyclers or non-profits will attempt and successfully be able to separate most beverage containers received for delivery to recycling refund materials recovery facilities for their deposit value. As an example, the ten cent deposit received for each aluminum can, the most valuable commodity handled by materials recovery facilities, will be approximately four times the scrap value received. However, exceptions to this are for:

- Steel cans, because there are very few steel beverage cans, the vast majority of steel cans received by materials recovery facilities are food cans, and sorting systems for steel cans separate them magnetically; and
- Glass bottles, because approximately half of glass containers are broken by time they reach a materials recovery facility sorting belt, and because single stream materials recovery facilities are designed to break glass bottles as early in the sorting process as possible, not making it possible to separate appreciable quantities of glass beverage bottles for their deposit value.

As Table 7 shows, the combined impact of a recycling refund system and existing recycling infrastructures are projected to result in an 88 percent overall weight-based recycling rate for beverage containers in Minnesota.

## 3.3. Recycling Refund System Costs

### 3.3.1. Overview of System Cost Analysis

This report accounts for costs on a transactional basis – that is, costs are estimated where payments are made from one party to another for goods, services, rents, labor, etc. A result of analyzing costs in this manner is that certain costs are not estimated by this report. Such costs include the value of consumers' time spent in redeeming containers and the transportation costs they may incur if redemption centers are not on their way or combined with other trips. While other recycling refund cost benefit analysis reports may

have attempted to estimate costs like these, little reliable data exists that could be considered applicable or transferrable to a Minnesota recycling refund system. Likewise, while beverage distributors will need to collect and remit deposits, file reports, and participate in audits related to deposits, these activities are normal and routine business functions similar to those already being performed by beverage distributors on a daily basis. The additional cost of performing these functions for the recycling refund program has been considered to be minor and incidental and has not been estimated in this report.

Other stakeholders who are not directly involved in operating the recycling refund system will experience financial impacts as a result of the system. Examples of these stakeholders include existing recyclers of beverage containers, municipalities who finance recycling programs, state regulatory and law enforcement personnel, and operators of waste disposal facilities. A discussion of the financial impacts to these stakeholders will be provided in Section 5 Costs and Benefits Resulting from the Recycling Refund System, rather than in this report Section 4, which is focused directly on the recycling refund system itself.

The recycling refund system envisioned by MPCA as described in Section 2.3 is unlike any other operating in North America because:

- All beverage containers are covered;
- A ten cent refund value applies for all sizes and for all materials;
- Returns go to privately owned and operated redemption centers with no regulated requirement for retailers to take back containers;
- Specific redemption center convenience standards are established; and
- An industry operated BCRO with ownership of unredeemed deposits.

As a result, there are no directly comparable systems operating in either the US or Canada, although the system operating in the Canadian province of Alberta most resembles the system proposed by MPCA; furthermore, almost all other recycling refund systems were in place prior to the development of comprehensive residential and private beverage collection infrastructure. Although information from other systems is useful and has been referred to, that information cannot be used directly for the Minnesota-specific analysis required by this study. For these reasons, the cost and effectiveness of this idealized system can only be determined by a model created by RSE, which has been build up from reference data and recovery and cost operating characteristics using clear and transparent assumptions described in this report section. It should be noted that applying different assumptions may produce a materially different result from the outcomes described in this report.

Figure 1 and Figure 2 at the beginning of this section depict a number of recycling refund system participants who would incur costs, including:

- Redemption centers, including on-site handling costs and collection costs associated with collecting beverage containers from bars, restaurants, and schools in the vicinity of the redemption centers;
- Transporters of redeemed containers from redemption centers to baling and glass beneficiation processors;
- Recycling refund baling facilities;
- Voluntary retail deposit-return locations; and the
- Beverage container recycling organization.

The costs incurred by each of these participants, and the key operating characteristics and assumptions that result in the cost estimates follow.

### 3.3.2. Redemption Centers

#### Convenience

Convenience requirements for redemption centers both in terms of location/distance and operating hours has a material effect on the scale and operating efficiency of the centers. This study has identified convenience criteria of at least one redemption site in every Minnesota County and one additional site for each additional 15,000 population or fraction thereof. These criteria result in the need for 402 redemption sites for the state, with an average population base of 13,264 people per site. Not all sites are alike, however – sites in urban counties would average a population base of 14,202 people per site, sites in suburban counties would average a population base of 12,123 per site, and sites in rural counties would average a population base of 9,147 people per site (the smallest site would service approximately 3,500 people). Other points of comparison include:

- California's redemption system, which has 2,578 buy-back sites (redemption centers), or 14,740 people per redemption center;
- Hawaii's redemption system, which has one return site for each 12,000 population; and
- British Columbia, which has 26,300 population on average per redemption site.[3]

In terms of operating hours, Minnesota redemption sites have been modeled as being open for 70 hours per week in urban and suburban counties, and 44 hours per week in rural counties.

#### Redemption Center Handling Fees and Cost Profiles

The BCRO will compensate redemption centers on the basis of per-container handling fees that will be determined by the BCRO and will not be fixed by legislation or a state regulatory agency. Handling fees may be adjusted as frequently as the BCRO believes is warranted. Ultimately the BCRO and its board of directors will determine the precise payment schedule to be used, which may include the following:

- Competitive bids and/or negotiations between the BCRO and prospective redemption site operators;
- Different compensation scales based on economies of scale (based on population served); or
- Different per container fees for different container material types (e.g., glass bottles compensated at a higher rate than aluminum cans).

In this report, redemption center costs are presented on an average per container basis, understanding that it is likely that different container material types will have different handling fee levels because of the different handling costs associated with each type.

RSE prepared an operating pro forma for three sizes of redemption sites as identified above in the convenience discussion (urban, suburban, and rural). Key assumptions include:

---

[3] British Columbia, with a population of 4.6 million, has 175 Return-It redemption sites that collect 90 percent of the returns (225 grocery stores collect the remaining 10 percent, but they only collect non-alcohol containers). The Return-It sites serve on average 26,300 people – if the limited service grocery stores are included in the convenience count, each return point serves a population base of 11,500 on average. The sizes of the Return-It redemption centers are segmented – there are approximately 65,000 people per Return-It site in the Vancouver metro region; approximately 35,000 people per Return-It site in other urban areas, and 10,000 people per Return-it site in rural areas.

- The BCRO will competitively contract with independent licensees' who will own and operate each site – licensees will earn a profit from each site's operations;
- Sites will be located in leased space similar to that found in strip centers and other commercial and/or industrial locations that meet the required convenience standards, with annual lease costs ranging from $8 per square foot on average in rural areas to $14 on average in urban areas, not including insurance, common area maintenance, and taxes – leased space will average 3,500 square feet per site;
- Participants who redeem containers at the redemption centers must sort containers into crates or trays by container material type (glass color sorting will be performed by redemption center operators and plastics sorting will be performed by baling sites);
- Redemption center employees will count containers and load redeemed containers into large reusable "big bag" sacks or large reusable crates that can be moved with floor jacks so that fork lifts are not required by redemption site operators;
- Redemption centers will lease a box truck with lift gate or similar equipment, and collect beverage containers generated on-premises from bars, restaurants, and schools in their vicinities; and
- Rural redemption centers will not be stand-alone enterprises – redemption operations will be added to some other enterprise, such as a rural municipal recycling center, so that staff can be utilized and productive throughout the day.[4]

Table 8 provides a summary of modeled costs for urban, suburban, and rural redemption centers in the state.

**Table 8 Redemption Center Modeled Annual Financial and Operating Results per Site**

| | Urban | Suburban | Rural |
|---|---|---|---|
| **Redemption Site Metrics** | | | |
| Number of redemption sites | 288 | 67 | 47 |
| Average container units returned per site per year (millions) | 9.6 | 8.2 | 6.2 |
| **Redemption Site Costs** | | | |
| Labor and proprietor's profit | $273,000 | $237,000 | $126,000 |
| Space lease | $65,000 | $51,000 | $44,000 |
| General and administration | $27,000 | $26,000 | $25,000 |
| On-premises collection expenses | $15,000 | $13,000 | $5,000 |
| ***Total*** | ***$380,000*** | ***$327,000*** | ***$200,000*** |
| **Average Cost per Container Returned** | **$0.0396** | **$0.0399** | **$0.0324** |

The average cost per unit figures shown in Table 8 are average costs per container redeemed. The weighted average cost, based on number of redemption centers of each type, is $0.0391.

As discussed previously, the costs presented in this section are dependent on economies of scale related to convenience, the fact that redemption sites must lease convenient commercial property and not operate out of supermarket parking lots or scrap metal yards, and must handle the diversity of materials specified for Minnesota's program.

[4] All redemption center costs, including full time equivalent labor and space costs, have been modeled on an average cost basis rather than an incremental cost basis, conservatively not presuming that undue savings from paired businesses will result.

### 3.3.3. Transporters

The following assumptions regarding transportation of beverage containers from redemption centers to processing locations were made:

- No crushing or densification is performed at redemption centers;
- Collection of redeemed containers from redemption centers is performed by independent contractors;
- Collection from urban and suburban redemption centers is performed using 26 foot box trucks with a lift gate – in rural areas, a tractor-trailer with lift gate and 45 foot van trailer will be used for collection;
- Redemption centers within 160 road miles of a glass beneficiary will be serviced by a dedicated glass collection box truck that will deliver the collected glass directly to the beneficiaries – a separate box truck will collect other beverage containers from these redemption centers and deliver those containers to the nearest recycling refund system baling facility; and
- Glass containers received by recycling refund system sorting/baling facilities located from 160 to 270 road miles from glass beneficiaries will be partially broken by those facilities and transported by roll-off truck and container once 20 ton loads of glass are accumulated (glass at sorting/baling facilities more than 270 miles from glass beneficiaries will be crushed for local fill/drainage medium uses).

RSE created a transportation model based on these parameters and truck lease and operating cost profiles to calculate the total transportation collection cost to the recycling refund system. The average transportation cost was found to be $0.0046 per container redeemed.

### 3.3.4. Recycling Refund Baling Facilities

The following assumptions regarding sorting and baling of beverage containers were made:

- The beverage container recycling organization owns and markets all processed material - sorting and baling is a competitively contracted service only;
- The average baling facility was assumed to bale collected recyclables from the nearest 20 redemption centers, or approximately 3,800 tons of non-glass plastic bottles, aluminum cans, steel cans, and aseptic and gable-top paper cartons per year;
- All baling facility costs have been modeled as if the facilities were dedicated facilities that only processed recycling refund containers under a long-term contract – the impact of this assumption is that processing costs are conservatively estimated, not presuming that undue savings from paired business operations will result – in reality existing processors of other materials, such as paper stock dealers or scrap metal yards, may receive processing contracts, especially in rural areas of the state;
- Baling facilities will sort plastic bottles by resin type (PET, HDPE Natural, HDPE Pigmented, mixed #3-#7) - all other materials arrive pre-sorted;
- Drink pouches are shredded and disposed because they lack markets; and
- Glass received at sorting/baling facilities more than 270 miles from glass beneficiaries will be processed on site with crushing and screening equipment for local uses such as fill/drainage medium with no material revenue assumed for such local glass uses (this will only occur with less than 3,000 tons of glass collected from nine counties in the extreme northwest part of the state, or two percent of the glass collected through the recycling refund system).

Based on these assumptions, handling, sorting, and baling costs were found to be on average:

- $200 per ton for non-glass materials;
- $21 per ton for glass crushing and screen in the northwest part of the state; and
- $5 per ton for glass handling at processors where it needs to be loaded into roll-off containers for long distance transportation to beneficiaries.

### 3.3.5. Voluntary Retail Deposit-Return Locations

Voluntary retail deposit-return sites have not been assumed to be a significant part of the recycling refund system. To the extent that there are such sites, it would be expected that retailers would insist that reverse vending machines be used for returns, and only conduct manual transactions for containers not able to be processed by the machines. In this study we have assumed that handling fees paid to voluntary retail deposit-return sites will not exceed the average handling fee compensation made to redemption centers.

### 3.3.6. Beverage Container Recycling Organization Costs

The beverage container recycling organization is responsible for the financial management of the recycling redemption program, including compensating the service providers discussed above. As discussed in Section 2.3, the BCRO will be able to keep unredeemed deposits to fund the operations of the system and will operate as a non-profit enterprise. To eliminate compensating sorting and baling facilities for taking on market price risk for processed recyclables, and to allow for premium market pricing for recyclables that comes from large quantities of materials marketed, it has been assumed that the BCRO will maintain ownership of and will market processed recyclables. To manage the impact of market price fluctuations on the net financial performance of the recycling refund system, it is assumed that the BCRO will establish a reserve account for market stabilization that build up excess revenues to a prudent level in years of high market revenues, and will draw down the funds in that account when market revenues are below average.

Table 9 provides a *pro forma* financial statement for the beverage container recycling organization. This statement summarizes the costs associated with each of the system participants as described above, along with internal organizational costs associated with the BCRO.

**Table 9 Beverage Container Recycling Organization Financial Statement**

| | $ millions |
|---|---|
| **Revenues** | |
| Beverage Container Deposits Received | 469 |
| Sale of Processed Materials | 76 |
| *Subtotal Revenues* | *545* |
| | |
| **Expenses** | |
| Deposits Refunded | 395 |
| Redemption Center Payments | 141 |
| Collection Contractor Payments | 17 |
| Processor Payments | 14 |
| Materials (Pallets, Crates, Sacks) | 1 |
| Administration | 4 |
| Promotion and Education | 2 |
| *Subtotal Expenses* | *574* |
| | |
| **Net Revenues (Deficit)** | **(29)** |

As Table 9 shows, the BCRO is forecasted to operate at an average annual deficit of $29 million from its own sources of funds. To reduce this deficit to zero, beverage distributors will be required to provide supplemental payments to the BCRO. The method of apportionment of this deficit to distributors will be a decision that the board of directors of the BCRO will make – it is very likely that distributors who package their beverages in low net-cost materials such aluminum will pay low or no additional fees for their aluminum cans, whereas they will be assessed higher cost rates for materials such as glass. It is estimated that

beverage distributors will need to provide supplemental funding to the recycling refund system of $0.0062 per container sold on average.

The amount of the deficit is significantly impacted by three line items – the percentage of deposits refunded, payments made to redemption centers, and average revenues from the sale of processed materials. Table 6 presented a return rate forecast that 84 percent of beverage containers sold would be redeemed. The assumptions around the handling cost payments to redemption centers (and voluntary retail collection) were discussed previously. Table 10 below presents average commodity market value and average annual revenues estimated to be received by the BCRO from the sale of marketed materials.

**Table 10 Average Annual Materials Market Revenues**

| Container Type | Market Value[1] ($/ton) | Marketed Quantity (tons) | Revenues |
|---|---|---|---|
| PET Bottles | 685 | 34,066 | $ 23,344,896 |
| HDPE Bottles | 448 | 8,240 | $ 3,695,086 |
| Other Plastic Bottles | 40 | 745 | $ 29,801 |
| Aluminum Cans | 1,576 | 28,890 | $ 45,530,844 |
| Steel Cans | 249 | 45 | $ 11,187 |
| Glass Bottles | 19 | 128,855[2] | $ 2,480,460 |
| Aseptic/Gable-top Cartons | 93 | 6,724 | $ 626,808 |
| Foil Pouches | -150[3] | 117 | $ (17,600) |
| **TOTAL** | | **207,565** | **$ 75,719,082** |

1 Based on average market pricing for deposit-quality recyclables over the three year period from 2010-2012. Prices are freight-on-board origin, except for color sorted glass, which is destination delivered.
2 Excludes quantity of glass crushed for local uses, which is assumed to have zero value.
3 Assumes statewide average disposal tip fees of $70 per ton plus average collection service costs of $80 per ton.

### 3.3.7. Fraud

Because of the value of the deposit at ten cents per container, and compensation for handling of redeemed beverage containers averaging approximately four cents per container, fraud will have the potential to have adverse financial effects to the BCRO and beverage distributors. Recycling refund system experts generally estimate fraud rates of two to five percent in U.S. deposit-return systems, which for the most part only collect five cent deposits on beverage containers.

There are a number of ways in which fraud can occur:

- Individual consumers can redeem containers on which a deposit has not been paid:[5]
  - Minnesota residents who live near the border of North Dakota, South Dakota, or Wisconsin may cross the border to shop, and return beverage containers purchased in those states to a Minnesota redemption center; and
  - Similarly, residents of North Dakota, South Dakota, or Wisconsin may cross the border into Minnesota to obtain deposits on beverage containers purchased in those states.

[5] The extent of this type of fraud will depend on the relative populations who live within a certain distance (on both sides) of the state border. Because of an existing recycling redemption program in Iowa, we would expect less impact, although the lesser five cent deposit value in Iowa may result in some impacts.

- Organized fraud;
  - In which large quantities of loose or potentially baled beverage containers can be acquired from recyclers in neighboring states and be trucked into Minnesota – this type of fraud would require a conspiracy between out-of-state recyclers and in-state recycling refund contract processors or redemption center operators to file a fraudulent claim for "reimbursement" to the beverage container recycling organization.
  - Falsified or inaccurate records by a redemption center operator or materials recovery facility who claims more tons of redeemed beverage containers shipped than are actually the case, or who claims more units redeemed than are borne out by bale weights.
- Fraud by distributors who fail to accurately report and remit deposits for the quantity of beverage containers they distribute in the state.

The potential for fraud will be higher in Minnesota than in other U.S. deposit states because the ten cent deposit is double that of the five cent deposits in those other states. The diversity of container sizes, material types, and per container weights under an expanded recycling refund system will make it harder to identify organized fraud because conversions of units to weight is more variable than is the case for deposit programs where only beer and carbonated soft drinks are covered.

Fraud can be minimized by:

- Limiting the number of beverage containers that individuals can return to redemption sites for a deposit refund – this will also help to minimize scavenging of deposit containers from residential and public spaces recycling containers;
- Only allowing in-state recycling centers, private recyclers, and non-profits to register with the BCRO and deliver separated beverage containers to recycling refund sorting/baling facilities for deposit refunds; and
- The BCRO implementing a robust audit and inspection program of its redemption center, transporter, and processor contractors and distributors.

The financial effects of fraud are embedded in the estimated "return" rates assumed in this report, and so are fully reflected in the system costs, both in terms of refunds paid and handling fees paid. The impact of treating fraud in this manner is a marginally higher reported beverage container recycling rate than would be the case if fraud were backed out of the analysis.

## 3.4. Role of Reverse Vending and Emerging Redemption Technologies

### 3.4.1. Reverse Vending Machines

Reverse vending machines (RVMs) reduce the amount of manual counting and handling of beverage containers that are returned for refunds. These machines receive and spin individual containers to find and scan the bar code printed on each container, which identifies the product, brand, and container size. This information is used by the machines to verify that each container is subject to a deposit return. Once all the returns by an individual have been processed, the machine prints a voucher or provides a cash refund. Figure 3 shows a bank of reverse vending machines at a retail grocery chain.

**Figure 3 Reverse Vending Machines**


Photograph courtesy of TOMRA North America, Inc.

The reverse vending machines in use in North America are designed to process container sizes up to three liters. As described above, they also must be able to rotate containers so that bar codes can be located and scanned. RVM's would be able to process a large percentage, but not all, of beverage containers that would be subject to the envisioned universe of containers covered by Minnesota's recycling refund program. In particular, the machines on the market today would not be capable of or may have difficulty processing the following container types:

- One gallon high density polyethylene milk jugs;
- One gallon polypropylene tea bottles;
- Large size oblong juice bottles (over thee liters);
- Jug-size glass wine bottles (three liters);
- Bag-in-box wine;
- Juice pouches;
- Beverage bottles smaller than six ounces (shot-size energy and liquor bottles).

RSE estimates that approximately five percent of beverage containers that would be subject to the prospective Minnesota recycling refund could not be processed by existing RVM designs. This could be an obstacle to widespread use of RVM in the state. In particular, it may limit the willingness of retailers to voluntarily take back beverage containers and offer deposit refunds since a fairly large percentage of individuals returning beverage containers would be expected to have at least one container type that could not be processed by existing machine designs, compelling that large percentage of consumers to request manual service rather than service by RVMs. For this reason, the calculations in this report are based on the assumption that voluntary retail return will be minimal, with virtually all returns occurring at independent

third-party redemption sites not located at large grocery locations.[6] Because retailers are where these machines are typically located, this also means that we have assumed that traditional RVMs will not be widely used in Minnesota. In any event, we would expect that RVM-based collection would attract the same payment obligations by the BCRO so that the use of RVM would not affect the overall system costs presented in this report.

### 3.4.2. Advanced Redemption Technologies

Advanced redemption technologies are being investigated in Oregon where beer, carbonated soft drinks, and water are covered by the state's deposit-return law. Until just a couple of years ago, all beverage containers were returned to retail. At the time of this report, the Oregon Beverage Recycling Cooperative (OBRC) had opened seven large redemption centers that are using and evaluating new and innovative approaches to redeeming beverage containers, ranging from 4,000 to 7,000-square-feet per site. Long range plans call for as many as 90 of these BottleDrop centers to open throughout the state These BottleDrop redemption sites provide three ways to redeem beverage containers, all in one return site:

1. Reverse vending machines;
2. Manual customer service desk (limited to 50 containers); and
3. EZ Drop bags.

What is innovative about these sites is that they allow consumers to drop off up to two EZ Drop bags full of beverage bottles per day. The EZ Drop bags are available for purchase at the redemption sites for 20 cents each, and hold from 25 to 100 beverage containers depending on the size of the containers in the bags. Participants register with OBRC and then simply fill the bags, apply a bar code sticker with their individual account information, and drop the bags off. Drop-off chutes are available outside of normal redemption center operating, allowing participants to drop off returns 24 hours per day. The personal bar code sticker on an EZ bag is first scanned by an employee in a back processing room, after which he opens the bag and discharges the contents into a mini processing equipment setup. This equipment setup singulates the containers, scans and counts them (using technology related to RVMs), and sorts them into material types using a combination of equipment and conveyors. The deposit return amount based on the count of containers in each bag is credited to the participants account within 24 hours of being dropped off.[7] While financial data on the OBRC redemption centers was not available for this report, OBRC is hopeful that transitioning from a retail return system to redemption centers using advanced redemption technologies will reduce the cost of Oregon's redemption system.

Employees at the BottleDrop sites also use equipment to densify aluminum cans into briquettes, crush glass bottles, and flatten PET bottles for transportation to an in-state PET reclamation market, so that baling sites are not required as part of the redemption system. The limited number of beverage container types covered by Oregon's system (aluminum, PET, and glass) and the presence of an in-state PET reclamation market mean that the approach used in Oregon and system cost there is not directly transferrable to Minnesota.

---

[6] There are no U.S. deposit-return laws where retail return is totally voluntary, as has been identified in the parameters of this study. U.S. deposit laws generally require large retailers to accept returns unless there is a redemption site within a specified convenient distance of those retailers. The Canadian province of British Columbia has a beverage container deposit return program for a similar diversity of beverage containers (except for milk) identified in this study – furthermore, retailers are required to accept returns. Notwithstanding this retail requirement, in British Columbia, only nine percent of returns are through grocery stores.

[7] A slide show of a BottleDrop site can be viewed at http://tinyurl.com/BottleDropTour.

# 4. Costs and Benefits Resulting from the Recycling Refund System

Recycling refund systems provide direct benefits such as an increase in the recovery of materials desired by industry as inputs into their manufacturing processes, and indirect benefits such as environmental quality improvements. Direct and indirect benefits provided by recycling refund systems include:

- Decreased litter;
- Energy savings;
- Reduced greenhouse gas emissions;
- Avoided acidification and eutrophication;
- Improvements to human and animal health;
- Decreased waste collection and disposal costs; and
- Net increases in employment, with some economic sectors realizing gains while others experience losses.

Costs include the cost of the recycling refund system as described above and employment losses that may result from the existing recycling system or reduced grocery sales that may result from increased product costs in the state.

RSE's scope of work was limited to materials recovery impacts, direct cost impacts, job impacts, and litter impacts – those impacts are discussed in the subsections below.

## 4.1. Recycling Refund System Impacts

Based on the figures presented earlier in Table 3 on estimated existing recycling quantities and in Table 7 for total beverage container recycling after a recycling redemption system would be implemented, beverage container materials recycled are projected to increase by approximately 93,000 tons, to an overall 88 percent recycling rate for beverage containers in the state.

The direct gross cost of the recycling refund system as reflected in Table 9, is $179 million per year, which is financed as follows:

- $76 million per year from revenues received from selling beverage containers to recycling markets;
- $74 million per year from consumers who choose to dispose beverage containers rather than return them or donate them to recyclers; and
- $29 million from beverage distributors.

Based on the labor requirements and cost model developed by RSE for this report, it is estimated that the redemption system will create 1,426 jobs, broken out as follows:

- 1,126 redemption center jobs;
- 136 collection/transporter jobs;
- 156 sorting/baling jobs; and
- 20 jobs with the beverage container recycling organization

## 4.2. Impacts to Existing Municipal and Private Waste and Recycling Systems

Beverage containers are currently being managed by municipalities and private service providers through existing recycling and waste collection and disposal infrastructures. The recycling refund system will have the effect of removing some portion of beverage containers from these existing recycling and disposal streams, some level of handling and disposal tip fee cost savings, as well as materials revenue losses from

recycling facilities. The statewide financial impacts to the general types of parties involved in these infrastructures are discussed in this section. Because specific financial arrangements between actual parties in these arrangements can vary significantly based on the agreements between the parties, three example case studies are included at the end of this section.

### 4.2.1. Impacts to Waste and Recycling Collection, Processing, and Disposal from Single-family Homes

The analysis in this section is focused on the quantities of recyclables managed through residential single-family home collection programs as opposed to all waste and recycling programs statewide. The purpose of presenting the impacts analysis in this way is to clearly portray average impacts to local authorities, who are the ones that commonly finance single-family residential recycling systems, but otherwise don't finance waste management and recycling services provided to commercial businesses or apartment complexes. We expect that the general conclusions on the extent of financial impacts presented in this section can be extended to other generating sectors beyond single-family residential homes, even though precise cost estimates are not provided.

Based on a survey of 332 municipalities in Minnesota, it is estimated that 62 percent of households are provided with recycling service contracted by local authorities, whereas 38 percent of households are in subscription areas where individual households subscribe for waste and/or recycling collection service with a hauler of their own choosing. Because single-family home recycling quantities from subscription areas cannot be readily segregated from existing system data, the analysis of this section is based on all single-family residential homes, and similar impacts are expected regardless of whether an individual household directly subscribes for its own service or whether service is contracted on its behalf by a local authority.

#### Materials Recovery Facility Impacts

Under the recycling refund system envisioned for Minnesota, single-family residential recycling collection of beverage containers would fall from current levels to an estimated 12,383 tons; residential materials recovery facilities will be allowed to separate out these beverage containers and deliver them to the redemption system for the ten cent per container refund value. It is estimated that materials recovery facilities will separate and deliver 5,241 tons, or 148 million beverage containers, of the 12,383 tons of beverage containers that they receive, and will collect $14.8 million of deposits refunded. The remaining 7,142 tons of beverage containers they receive but don't separate, largely composed of broken mixed glass, will be sold by materials recovery facilities for a value of $ (0.1) million, since broken mixed color glass has an overall negative value and it would be the largest remaining beverage container component.

Table 4 noted that 150,606 tons of beverage containers are estimated to be generated in single-family residences. Single-family residential recycling collection programs are currently estimated to collect and market 74,165 tons per year of beverage containers, which are sold for an estimated $15.4 million per year. As Table 11 shows, the overall impact of the recycling refund system on single-family residential recyclables revenues managed by existing materials recovery facilities will be a net reduction $0.6 million per year, or $0.03 per single-family household per month.

**Table 11 Materials Recovery Facility Revenues from Single-Family Beverage Containers after Recycling Refund System Implementation[1]**

| Container Type | Single-family Residential Recycling (tons) | MRFs Redemption of Single-family Containers Received | | | MRFs Recycling of Remaining Containers | | | Existing System MRF Revenues | | Change in Revenues |
|---|---|---|---|---|---|---|---|---|---|---|
| | | tons | million units | $ million | tons | $/ton | $ million | tons | $ million | $ million |
| PET Bottles | 2,446 | 2,201 | 69 | 6.9 | 245 | 438 | 0.1 | 10,190 | 4.5 | 2.5 |
| HDPE Bottles | 729 | 656 | 9 | 0.9 | 73 | 485 | <0.1 | 3,038 | 1.5 | -0.5 |
| Other Plastic Bottles | 311 | 264 | 4 | 0.4 | 47 | 40 | <0.1 | 357 | <0.1 | 0.3 |
| Aluminum Cans | 893 | 875 | 60 | 6.0 | 18 | 1,510 | <0.1 | 7,438 | 11.2 | -5.2 |
| Steel Cans | 4 | 0 | 0 | 0.0 | 4 | 250 | <0.1 | 19 | <0.1 | 0.0 |
| Glass Bottles | 7,941 | 1,191 | 4 | 0.4 | 6,750 | -35 | -0.2 | 52,942 | -1.9 | 2.0 |
| Aseptic/Gable-top Cartons | 60 | 54 | 2 | 0.2 | 6 | 125 | <0.1 | 181 | <0.1 | 0.2 |
| Foil Pouches | 0 | 0 | 0 | 0.0 | 0 | -150 | 0.0 | 0 | 0.0 | 0.0 |
| **TOTAL** | **12,383** | **5,241** | **148** | **14.8** | **7,142** | | $ -0.1 | **74,165** | 15.4 | -0.6 |

1 Materials revenues in this table are for beverage containers only and do not include the revenue contributions from other packaging and paper materials collected from single-family homes.

RSE also evaluated the impact of the recycling refund system on materials recovery facility processing costs. The reduction in beverage container received, especially PET and aluminum cans, may result in capital expenditures for optical and eddy current sorters no longer being economical in materials recovery facilities, so that container sorting will more likely be performed manually than is the case currently. Furthermore, manual sorters will be relied on to separate the remaining beverage containers by hand from non-beverage containers for the deposit value, a function that automated materials recovery facility sorting equipment is not designed to perform. As a result no net labor reduction, processing cost savings, or jobs impacts are forecasted for materials recovery facilities by this study.

## Recycling Collection Impacts

The recycling refund system has the potential to reduce the costs that service providers have of collecting and processing beverage containers based on a reduction of the quantities managed by those service providers.

Residential recycling collection trucks normally fill before the end of the collection day and drivers typically need to leave their route, empty, and return to their route to complete their collection activities for the day. RSE estimated the overall existing volume of Minnesota statewide residential recyclables collected for recycling, including beverage containers and other packaging and paper, by multiplying estimates of tons collected by density conversion factors. We also estimated the tonnage and volume in cubic yards of beverage containers projected to be diverted from residential recycling collection, and projected that the collection volume would fall by 20 percent, allowing trucks to collect recyclables from 20 percent more homes before they fill. Because this savings would mostly impact the time spent travelling off route to empty recyclables, and would not significantly impact the on-route productivity, the net time savings to residential collection is estimated by RSE to be a 13 percent reduction in overall time spent. According to the 2007 U.S. Economic Census of Minnesota waste and recycling haulers, the payroll associated with collection composes 19 percent of total customer billings.[8] Assuming this percentage is also representative of recycling collection, and assuming that the average single-family residential household charge for residential curbside service is $3.50 per household per month, the estimated collection cost savings that should be passed down to local authorities and subscription households would be $0.09 per household per month.

The Container Recycling Institute has a jobs calculator for estimating the potential jobs impact that a potential recycling refund system could have. While RSE did not use CRI's jobs calculator for estimating jobs impacts for this study, we did utilize certain jobs per 1,000 tons throughput factors from CRI's calculator for the calculations performed by this study. In the case of recycling collection, CRI estimates that there are 2.3 recycling collection (including administrative staff, maintenance staff, and management staff) per thousand tons of residential recyclables collected. Using that factor, the 16 percent savings discussed above, and the estimate of the total residential recyclables tonnage currently collected in Minnesota (approximately 445,000 tons), we have estimated that 136 residential collection jobs will be lost as a result of the recycling refund system.

## Waste Collection and Disposal Impacts

A recycling refund system will also collect beverage containers that otherwise would be disposed in the single-family home residential waste stream. Single-family residential beverage containers disposed are projected to fall from 76,442 tons to 13,723 tons, which would save an estimated $4.4 million per year or

[8] 2007 U.S. Economic Census, filtered for NAICS 562111 Solid Waste Collection, and the geographic area of Minnesota.

$0.21 per household per month in avoided tip fees, based on a statewide average disposal tip fee rate of $70 per ton.

The portion of beverage container recyclables in disposed residential waste is much smaller than in recyclables. Also, residential waste collection trucks use high compaction ratios so that they are normally able to stay on route for the entire collection day before filling. Using a factor from CRI of 1.17 waste collection jobs per thousand tons, and 0.04 landfill jobs per thousand tons. Based on these factors, and much smaller proportion of time savings from waste collection compared to recycling collection, only 6 jobs statewide were estimated to be lost from waste collection and disposal from all waste generating sectors, or 3 jobs from the single-family residential waste stream. This small impact was not estimated to have any discernable price effect on waste collection costs, and therefore no waste collection cost savings has been estimated.

### Total Financial Impacts to Local Authorities and Individual Subscribers

The net impact to local authorities and individual single-family residential subscribers of the recycling refund system would therefore be:

- Materials recovery facility revenue reduction of $0.6 million, or -$0.03 per single-family household per month;
- Recycling collection cost savings of a net impact of approximately $0.2 million per year, or $0.09 per single-family household per month;
- Avoided tip fee disposal savings of $4.4 million, or $0.21 per household per month.

The total impact of the recycling refund system to local authorities and individual subscribers would be a net benefit of $0.27 per single-family household per month.

### 4.2.2. Minnesota Case Study Examples

*[The results of the impact on three Minnesota governmental entities are currently being reviewed by those jurisdictions and will be included in the final report.]*

## 4.3. Impacts to Markets and Beneficiation Facilities

According to an interview with Verallia conducted for this study, only approximately 40 percent of single-stream glass received by beneficiaries can be economically prepared to a suitable quality for glass container manufacturing. Alternatively, according to Verallia, 99.5 percent of deposit glass can be prepared for glass container manufacturing. A recycling refund system will result in higher quantities of glass going to higher value recycled product applications than would be the case under the existing system. Similarly, the improved quality and controlled sourcing of PET under the recycling refund system would benefit PET reclaimers in other states (there are currently none in Minnesota) who recycle PET closed loop back into bottles. While improved quality under recycling refund systems has been demonstrated for glass and PET, and improved market prices paid for glass and for PET by recyclers have been incorporated in in the revenue calculations in this report, similar price impacts from quality improvements for other materials are not as apparent and have not been included.

Some 88,000 tons of glass containers, including food container glass but excluding non-glass contamination, are currently estimated to be recycled by glass beneficiation facilities in the state. Based on a recovery increase to 141,000 tons of glass containers (including food glass) recycled under a combination of the existing system and the recycling refund system, RSE estimates that an additional 14 glass beneficiary jobs would be created in the state as a result of the recycling refund system.

In general, this study has assumed that the recycling refund system will result in more locally recovered materials being available to in-state manufacturers, which may reduce their costs of manufacture and may lead to increased sales and job growth. However, such estimates require detailed regional market studies to track the flows of recyclables both into and from the state, including freight calculations, which was beyond the scope of this report. To be conservative, no additional jobs have been assumed at Minnesota mills, reclaimers or product manufacturers in this analysis.

## 4.4. Impacts to Beverage, Hospitality, and Retail Industries

### 4.4.1. Sales Impacts

Some in the beverage industry assert that beverage sales in Minnesota will fall as a result of the recycling refund system, both on a temporary basis shortly after it is implemented, as well as on a long-term permanent basis. This potential sales reduction can come from three causes:

1. The recycling redemption system operating deficit identified earlier in the report, which would require beverage distributors to provide supplemental funding to the system of approximately $29 million per year, or $0.0062 per beverage container on average, which may result in higher shelf prices to consumers that result in reduced product sales;
2. The presence of the deposit, which consumers may elect to forfeit if they choose to not return beverage containers for the deposit refund; and
3. Residents in Minnesota counties that border non-deposit states driving across state boundaries to do their grocery shopping in non-deposit jurisdictions.

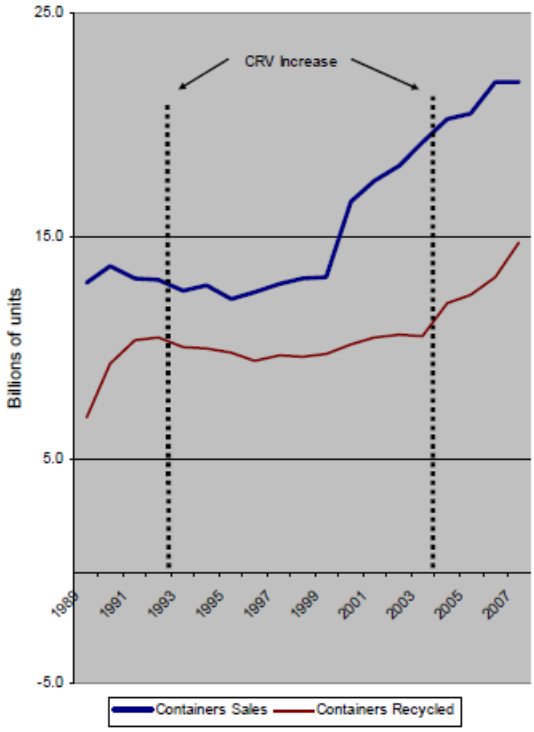
There have been a number of studies that present conflicting conclusions regarding whether beverage deposits impact sales and RSE reviewed those studies for this report. Studies that assert there are job losses are based on economic impact models in which researchers input price-purchasing elasticity factors into the models to forecast sales losses associated with price increases. The seminal study most referenced for job loss calculations that uses this modeling approach was conducted at the University of Kentucky in 1999; however, the same approach to modeling job losses is used today by industry groups.[9] Alternatively, conflicting studies point to state sales data when deposit programs are either implemented, containers added to the deposit, or the deposit level increased. These studies portray no apparent change in consumption trends as a result of recycling refund programs or their changes. Figure 4 is excerpted from one of these studies, which analyzed California data (one of the two most-recently implemented deposit-return states).[10]



[9] "The Economic Impact of a Container Deposit Program in Kentucky," the Center for Business and Economic Research, University of Kentucky, March 1999.

[10] "Evaluating End-of-Life Beverage Container Management Systems for California," R3 Consulting Group Inc. and Clarissa Morawski, May 2009.

**Figure 4 Impact of California Redemption Value on Sales**




California's redemption program began in the fall of 1987, collecting a 1 cent deposit (California Redemption Value, or CRV). As Figure 4 shows, California beverage container sales increased from 1989 to 1990, after which they had several years of decline, and then in 2000 began to increase steadily again. As the study report states:

> "Deposits were increased in 1989 from 1 cent to 2 cents; in 1993 from 2 cents to 2.5 cents; and in 2004 from 2.5 cents to 4 cents. More recently, in January 2007, the deposit was further increased from 4 cents to 5 cents for small containers and from 8 cents to 10 cents for large containers...In the years directly following both CRV increases there was no disruption of sales trends, either upwards or downwards. This suggests that the introduction of the CRV, as well as two increases to the CRV, had no impact on sales."

Based on the studies reviewed by RSE, there does not appear to be conclusive evidence to support the assertion deposit programs result in permanent decreases in consumer consumption of packaged beverages.

The University of Kentucky study also investigated sales shifts across state borders that used statistical regression analysis to evaluate the impact of the deposit compared to other factors, such as differing state sales taxes, in the counties on both sides of the border of deposit states. The University of Kentucky concluded that sales shifts do occur, and RSE used data from that study to estimate sales shifts (and job shifts) outside of the state. Based on the results of the University of Kentucky analysis, supermarket and grocery retailers in Minnesota may lose 0.5 percent of sales statewide, resulting in a shifting of 214 jobs to neighboring states. To the extent that beverage distributors in Minnesota only distribute their products in

state (and not in adjoining counties in surround states), Minnesota beverage distributors may lose up to 39 jobs that would shift to neighboring states.[11] There will be some loss to state and local tax revenues as a result of the estimate of grocery purchases that goes out-of-state, although this loss has not been estimated by this report.

### 4.4.2. Regulatory Agency Impacts

This study estimated that an additional 4 jobs with the State of Minnesota will be created that are primarily related to law enforcement (e.g., fraud criminal investigations), as well as some staff time associated with regulating the private non-profit beverage container recycling organization that will operate the recycling redemption system. A cost estimate for these jobs has not been prepared in this report.

## 4.5. Litter Reduction

The amount of beverage containers currently littered in Minnesota is difficult to estimate due to the lack of Minnesota-specific litter data and variation in the data reported from elsewhere. One study that reviewed litter data from numerous other studies found that beverage containers were reported to compose between 4.4 percent and 21 percent of litter. A nationwide study conducted by Keep America Beautiful entitled “2009 National Visible Litter Survey and Cost Survey” counted beverage containers at only 2.9 percent of all litter (which includes cigarette butts in the calculation), and 14.5 percent of litter larger than 4 inches. Yet another study by the Washington Department of Ecology determined that 26.7 percent of litter was made up of aluminum cans, plastic bottles and glass bottles in that state. Litter data is typically reported on the basis of unit counts, which is number of beverage containers counted divided by the total number of pieced of litter observed, and depending on how and the extent to which small components of litter are counted will significantly impact any estimate of the actual quantities of beverage container litter.

Beverage container relative litter reduction factors resulting from deposit programs may be more applicable to Minnesota than quantity estimates. Litter reduction depends on many factors including the percentage of beverage containers covered in deposit programs and the value of the deposit. For example, if a deposit state only includes beer and soft drinks in its program, littering rates for those containers will differ from littering rates for bottled water containers that are not included in the deposit program. Higher deposits can also be expected to have a greater impact than the typical five cent deposit collected on small beverage containers in other states. This makes it difficult to use litter data from other deposit states, which are less comprehensive than that considered in Minnesota, and apply that data to make Minnesota estimates. At a minimum, data from other deposit jurisdictions can be reviewed and any estimates made from those studies can be considered conservative in Minnesota’s case. Table 12 shows the results of litter studies in deposit states – in Minnesota’s case, beverage container litter can be estimated to be reduced by approximately 85 percent, and overall litter by 40 to 50 percent.

[11] "The Economic Impact of a Container Deposit in Kentucky" found that grocery sales decreased by 3.2 percent in counties that border non-deposit states. Minnesota counties that border North Dakota, South Dakota, and Wisconsin contain 16 percent of Minnesota’s population. Because Iowa also has a deposit, the population of Minnesota’s southern border counties was not included in this estimate. The overall statewide potential grocery reduction is therefore 0.5 percent. Total state grocery jobs are based on U.S. Census Bureau, 2011 County Business Patterns, which identified 41,111 grocery jobs in the state for NAICS 445110 Supermarkets and Other Grocery. The Minnesota Beverage Association on its website reported that their members employed 5,310 in Minnesota in 2012. Similarly, the Beer Institute in “Beer Industry Economic Impact in Minnesota” reported 2,160 beer distributing jobs in the state in 2012.

**Table 12 Litter Reductions from Beverage Container Deposit Programs**

| State | Beverage Container Litter Reduction | Total Litter Reduction |
|---|---|---|
| Iowa | 76% | 39% |
| Maine | 69-77% | 34-64% |
| Massachusetts | N/A% | 30-35% |
| Michigan | 84% | 41% |
| New York | 70-80% | 30% |
| Oregon | 83% | 47% |
| Vermont | 83% | 35% |

Source: Proceedings of the July 11, 2002 hearing before the Committee on Environment and Public Works of the U.S. Senate (www.access.gpo.gov/congress/senate/pdf/107hrg/83716.pdf)

Cost savings from litter reduction cannot be readily determined. While some studies assert that the cost of collecting litter ranges from $1,200 per ton to $2,300 per ton, those studies do not report actual cost reductions resulting from reduced litter in deposit states. Litter collection is much like residential curbside recycling collection. While some cost savings may occur, the cost savings will be much smaller than a direct proportional reduction based on total litter reduction percentages, since local authorities must still patrol and collect the remaining litter from areas maintained by them. Because of the lack of Minnesota-specific litter cost data, cost savings that may result from litter reductions, and quantity of beverage containers currently littered in Minnesota, reliable estimates of litter reduction cost savings could not be made for this report.

## 4.6. Summary of Costs and Benefits Resulting from the Recycling Refund System

In summary, Table 13 shows the projected increases in beverage containers recycled in Minnesota as a result of the prospective recycling refund program:

**Table 13 Increase in Beverage Container Recycling from a Recycling Refund Program**

| Beverage Materials | Tons | Millions of Containers |
|---|---|---|
| PET Bottles | 13,157 | 411 |
| HDPE Bottles | 3,480 | 47 |
| Other Plastic Bottles | 70 | 1 |
| Aluminum Cans | 14,099 | 968 |
| Steel Cans | 28 | 0 |
| Glass Bottles | 61,513 | 219 |
| Aseptic/Gable-top Cartons | 272 | 11 |
| Foil Pouches | 0 | 0 |
| **TOTAL** | **92,618** | **1,658** |

In addition to the increase in quantity of beverage containers recycled, the quality of the collected commodities would be improved over that of the existing recycling systems.

The cost increase associated with these higher recycling levels is estimated at:

- $29 million to operate the recycling redemption system, incurred by beverage producers;

- Less than $1 million incurred by the State of Minnesota, not including state tax loss impacts that may occur from reduced in-state grocery sales;
- Undetermined costs incurred by consumers in transporting beverage containers to redemption sites.

The following annual cost reductions are also projected to result:

- $5.6 million realized by local authorities and individual single-family home waste and recycling service subscribers;[12] and
- Undetermined savings to state and local authorities for reduced litter cleanup.

The recycling refund system is estimated to have the following Minnesota jobs impacts:

- Increases of:
  - 1,438 recycling refund system jobs;
  - 14 glass beneficiation jobs;
  - 4 state law enforcement and regulatory agency jobs; and
  - Undetermined potential for in-state recycling manufacturing jobs.
- Decreases of:
  - 214 supermarket and grocery jobs;
  - 39 beverage industry production and distribution jobs (note, jobs will be shifted to other states but are not forecasted to be actually lost);
  - 136 residential recycling collection jobs;
  - 6 waste collection and landfilling jobs.

The total job impact is forecasted to be a net gain of 1,064 jobs.

In addition to the above benefits, energy savings and environmental quality benefits would occur from the recycling redemption program. It was beyond the scope of this report to estimate these benefits.

## 4.7. Estimated Impacts to Specific Stakeholder Groups

Following are a summary of estimated financial and job impacts from the perspective of various stakeholders:

- Consumers
  - Financial impacts:
    - Potential price increase of $29 million per year or $0.006 per container purchased if beverage distributors and retailers pass the full cost of the recycling refund on to consumers;
    - Undetermined costs incurred by consumers in transporting beverage containers to redemption sites; and
    - $74 million in unredeemed deposits (only incurred by those consumers and bars/restaurants that choose to not return beverage containers for the deposit).
- Beverage industry
  - Financial impacts – from 0 to $29 million per year, depending on if supplemental payments to the recycling refund system can be passed on to consumers in price increases; and
  - Job impacts – shift of 39 jobs from Minnesota to surrounding states.

[12] Although impacts to industrial, commercial, institutional, and multi-family residential establishments could not be estimated in this study, it is reasonable to assume that the collective savings to these establishments would be marginally smaller than, although similar in magnitude to, that of single-family homes.

- Supermarkets
  - Financial impacts – loss of 0.5 percent of sales on a statewide basis (losses will occur in counties that border states without beverage container deposits); and
  - Job impacts – shift of 214 jobs from Minnesota to surrounding states.
- Local governments and individual residential single family home waste services subscribers
  - Financial impacts;
    - $5.6 million net annual cost savings ($0.27 per household per month) from avoided disposal cost savings and residential recycling collection cost savings after accounting for reduced residential recycling program commodity revenues; and
    - Undetermined savings from reduced litter clean-up costs.
- Materials recovery facilities
  - Financial impacts;
    - Net lost commodity revenues of $0.6 million after including offsetting revenues from returning beverage containers for their deposit value, assumed to be passed on to local governments and hauler customers for no long-term cost impact; and
    - Lost tip fee revenues due to reduced incoming tons, assumed to net zero after adjusting tip fees to result in no long-term cost impact;
  - Job impacts – none.
- Waste and recycling haulers and waste disposal facilities
  - Financial impacts
    - Loss of $4.4 million in disposal facility tip fee revenues; and
    - Loss of $0.2 million in recycling collection revenues.
  - Job impacts
    - Loss of 136 residential recycling collection jobs; and
    - Loss of 6 jobs waste collection and landfill jobs.
- Glass beneficiaries
  - Financial impacts - improved revenues from sale of more processed glass to high-value glass container manufacturing markets; and
  - Job impacts – gain of 14 jobs.
- Recycled product producers
  - Financial impacts – potential to source additional raw materials from in-state sources with the potential to reduce sourcing costs and increase product sales; and
  - Jobs impacts – undetermined, depends on financial impacts and sourcing relationships.
- State of Minnesota
  - Financial impacts
    - Additional cost of less than $1 million for law enforcement and regulatory agency costs; and
    - Loss of 0.5 percent of grocery and alcoholic beverage container sales taxes.
  - Job impacts
    - 4 agency jobs gained; and
    - 1,064 net jobs gained in the state.
- Non-profit Groups
  - Financial impacts – potential to generate additional revenues from collecting donated beverage containers for their refund value.