

PAY AS YOU THROW (PAYT) IN THE US: 2006 UPDATE AND ANALYSES

FINAL REPORT

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1 EXECUTIVE SUMMARY

“Pay as you throw” (PAYT) systems, also known as variable rates programs or user pay, ask households to pay more if they put out more garbage for collection. This simple concept – akin to paying a water or electricity bill – has been embraced by almost 7,100¹ in the United States, and has led to the diversion of perhaps 6.5 million tons of municipal solid waste (MSW) per year² that would otherwise have been landfilled. The research in this paper shows these programs are available to about 25% of the US population and about 26% of communities in the US – including 30% of the largest cities in the US. Based on the computations, the PAYT programs currently operating in the US are leading to reductions of:

- 2.1-3.8 million metric tons of carbon equivalents annually,
- 7.8-13.3 million metric tons of carbon dioxide equivalents annually,
- 61-109 million MBTU³ annually
- 4.6-8.3 million tons of MSW from landfills annually.

But PAYT means much more to diversion than simply its equity and growing prevalence.

- First, the programs are flexible and quick to implement – they are in place in large communities, but also in very small ones and everything in-between and have been implemented in as few as three months if there is political will behind the program.
- Second, they have an advantage over only simply implementing recycling programs because PAYT encourages not only recycling, but also composting, source reduction, reuse, and the host of responsible methods of dealing with waste.
- Third, the systems have a huge impact on diversion – reducing residential disposal by about 17% -- often with low administrative costs.

The research has demonstrated that PAYT is the most effective single action that can increase recycling and diversion, and can also be one of the most cost-effective.

Incorporated within this document, we provide an update to previous research conducted on PAYT – addressing several key topics:

- Updating the count of PAYT programs in the US and penetration in terms of the percentage of communities and the population with PAYT programs available.
- Examining the greenhouse gas reductions attributable to the spread of PAYT programs in the US.
- Analyzing the role of PAYT in increasing diversion.
- Assessing the impacts of PAYT on costs.

The document provides a summary of the results from major research conducted on PAYT to date, and discusses issues related to reaching the EPA's 40% diversion goal. It also provides suggestions for strategies for increasing the implementation of PAYT across the US.

¹ Based on computations in this document.

² Based on computations later in this document. These tons are based on a combination of the tons diverted to recycling, composting, and source reduction.

³ MBTU stands for one million BTUs (British Thermal Units), which is used as a measurement for the energy content of fuels, including MSW.

2 BACKGROUND ON PAYT: EFFECTIVE DIVERSION INCENTIVES

Currently, in most parts of the country, garbage is removed once or twice a week with revenues coming from one of two places:

- A portion of property taxes; or
- A fixed bill amount that does not vary with respect to the amount of garbage taken away.

Neither of these methods provides any incentives to reduce waste. In fact, with the property tax method of payment, customers never even see a bill and generally have no idea how much it costs to remove their garbage regularly. Areas using this method of payment have sometimes implemented mandatory recycling programs to reduce their amount of garbage.

2.1 Types of PAYT Programs

Over the last 20 years, a growing number of communities across North America have been using the user-pay principle used commonly for water, electricity, and other services. User-Pay, Variable-rate pricing, or “Pay As You Throw” (PAYT) is a strategy in which customers are provided an economic signal to reduce the waste they throw away, because garbage bills increase with the volume or weight of waste they dispose. PAYT is being adopted in thousands of communities to create incentives for additional recycling and waste reduction in the residential sector.

PAYT programs are very flexible and have been implemented by communities in many forms. The most common types of PAYT programs are can programs, bag programs, tag and sticker programs, and hybrid programs. Other less common programs include are weight-based rates. Each program type – can, bag, sticker/tag, hybrid, and weight-based – is briefly summarized in the following highlighted box.

Each system has strengths and weaknesses and, except for weight-based systems, are in place in many communities across the US and Canada. Using these systems, communities realize savings through reduced landfill usage, efficiencies in routing, staffing, and equipment, and higher recycling. However, there are some disadvantages. Collection changes can lead to additional costs and new administrative burdens (monitoring and enforcement, billing, etc.), rate-setting and revenues are more complex and uncertain, and significant expenditures for public education outreach are necessary for successful implementation of a PAYT program.

In addition, some systems are more appropriate than others, depending on local conditions. Larger communities and urban and suburban communities tend to use can programs – especially if they have automated collection. Smaller communities and more rural communities are more likely to use bag, tag, or sticker programs. Bag and drop-off programs are most prevalent in the East, can and bag programs are most common in the Midwest and the South, and can programs are the most popular in the western U.S.

2.2 Penetration of PAYT Programs in the US

PAYT programs in the US have grown from about 100 in the late 1980s to about 1,000 in 1993⁴ to about 4,150 in 1997⁵ to 5,200 in 2001.⁶ The latest update – for 2006 – shows a total of PAYT is currently available to residents in almost 7,100 jurisdictions across the US currently. Table 1 presents the count of communities with PAYT and share of total communities in the State that have PAYT available. This update shows significant growth since previous reports.

- The community total exceeds 7,000.
- These programs are now available in about ¼ of communities in the US (and are available to about 25% of the US population).
- The largest number of programs is available in Minnesota (mandated), Iowa, Wisconsin, California, New York, Washington, and Pennsylvania, each with more than 200 programs.

- **Variable Can or Subscribed Can.** In this program, customers select the appropriate number or size of containers (one can, two cans, etc., or 30–35 gallons, 60–65 gallons, etc.) for their standard weekly disposal amount. Rates for customers signed up for two- or three-can service are higher than rates for one-can customers. Some communities also have introduced mini-can (13–20 gallons) or micro-can (10 gallons) service levels to provide incentives for aggressive recyclers.

- **Bag Program.** In this program, customers purchase bags imprinted with a particular city or hauler logo, and any waste they want collected must be put in the appropriately marked bags. Bags holding from 30 to 35 gallons are most common; some are smaller. Sales through community centers; or grocery and convenience stores are most common (sometimes with commission) and minimize inventory and invoicing issues. The bag cost incorporates the cost of the collection, transportation, and disposal of the waste in the bag. Some communities charge all costs in the bag price; others charge a separate customer charge to reduce risks in recovering fixed system costs.

Tag or Sticker Programs. These are almost identical to bag programs, except instead of a special bag, customers affix a special logo sticker or tag to the waste they want collected. The tags need to be visible to collection staff to signal that the waste has been paid for. Like the bag program, tags are usually good for 30-gallon increments of service. Pricing and distribution options are identical to bag programs.

Hybrid System. This system is a hybrid of the current collection system and a new incentive-based system. Instead of receiving unlimited collection for payment of the monthly fee or tax bill, the customer gets only a smaller, limited volume of service for the fee (typically 1 or 2 cans or bags). Disposal of extra bags / cans beyond the approved base service requires use of bags or stickers, as described above. This system is attractive to communities as it requires no change in billing system, containers, or collection system, and the base service can be tailored to suit the community. Many customers see no change in bills; large disposers are provided an incentive to reduce.

Weight-based System. Called “Garbage by the Pound” (GBTP) in its earliest US test (1989), this system uses truck-based scales to weigh garbage containers and charge customers based on the actual pounds of garbage set out for disposal. On-board computers record weights by household, and customers are billed on this basis. Radio frequency (RF) tags, are affixed to the containers to identify households associated with the can weight for billing. These programs have been pilot-tested in the U.S., and implemented overseas. Certified scale systems are now available in the US; however, despite multiple pilot tests in North America, they are not in full scale use in US or Canadian communities (except one community charging by GBTP for commercial businesses).

Other Variations. Some communities or haulers offer PAYT as an option along with their standard unlimited system. Waste drop-off programs, charging by the bag or using punch cards or other customer tracking systems, are also in place in some communities, especially in rural areas.

⁴ Skumatz, Lisa A., Ph.D., “Variable Rates for Municipal Solid Waste: Implementation Experience, Economics, and Legislation”, Skumatz Economic Research Associates, prepared for Reason Foundation Policy Study No. 160, Los Angeles, CA June 1993.

⁵ Skumatz, Lisa A., Ph.D., “The state of variable rates: Economic signals move into the mainstream”, *Resource Recycling*, August 1997.

⁶ Skumatz, Lisa A., Ph.D., “Maximizing VR/PAYT Impacts – Policies, Rate Designs, and Progress”, *Resource Recycling*, June 2001.

- States with the largest share of communities with PAYT available include: MN, WA, OR (all mandating or virtually mandating PAYT), followed by WI, NH, MA, IA, CA, MI, and NY – all with PAYT available in 40% or more of the communities in the state. WI and NH had more than 75% of communities with PAYT.
- The total US population covered by these programs is nearly 75 million, or nearly 25% of the US population.

Figures 1, 2, and 3 map the prevalence of PAYT programs by state, showing the number of communities, percent of communities, and percent of population covered, respectively. The information shows that states in the Midwest and west have the most programs by state, but that in some cases, this does not reflect high percentages of the state's communities or population.

Table 2 shows that, overall, there was almost 70% growth in PAYT communities in the last decade, and six states that had no programs 10 years ago, now have PAYT programs in place. Table 2 also shows those states with most active growth since 1997. Some states showed especially high percentage growth because they started with very few programs (e.g., AR, DE, FL, KS, MT, NM, NV, SC, VA, and WY). Some of these have added a significant number of programs, with Arkansas being particularly active. California, Iowa, Indiana, Massachusetts, Maine, Michigan, Minnesota, New York, Oregon, Pennsylvania, Washington, and Wisconsin each added more than 50 PAYT communities since 1997. Wisconsin, Oregon, and Minnesota had laws in place mandating implementation in some or all communities.

Table 1: US PAYT Communities and Share of Communities Covered, by State
(Source: Skumatz Economic Research Associates, Inc. surveys, 2005-2006)⁷

State	Number PAYT Communities	% PAYT of All Communities in State	State	Number PAYT Communities	% PAYT of All Communities in State	State	Number PAYT Communities	% PAYT of All Communities in State
AK	3	0.9%	LA	1	0.3%	OH	243	23.1%
AL	2	0.4%	MA	139	59.1%	OK	2	0.3%
AR	80	15.4%	MD	49	13.3%	OR*	336	100.0%
AZ	5	2.0%	ME*	158	7.4%	PA	253	18.0%
CA	536	49.6%	MI	302	47.9%	RI	9	33.3%
CO	59	16.7%	MN*	1,850	100.0%	SC	13	3.5%
CT	25	20.8%	MO	36	3.7%	SD	20	5.7%
DC	0	0.0%	MS	0	0.0%	TN	2	0.5%
DE	12	16.0%	MT	14	5.1%	TX	20	1.3%
FL	9	1.0%	NC	64	9.8%	UT	65	22.5%
GA	43	7.2%	ND	8	2.1%	VA	7	1.9%
HI	0	0.0%	NE	18	3.4%	VT*	180	20.3%
IA	539	56.5%	NH	45	75.0%	WA	522	100.0%
ID	25	12.2%	NJ	55	10.9%	WI	512	81.3%
IL	170	12.9%	NM	2	0.9%	WV	20	7.1%
IN	173	28.8%	NV	4	5.7%	WY	2	1.0%
KS	8	1.3%	NY	445	42.4%			
KY	1	0.2%				Total	7,095	26.3%

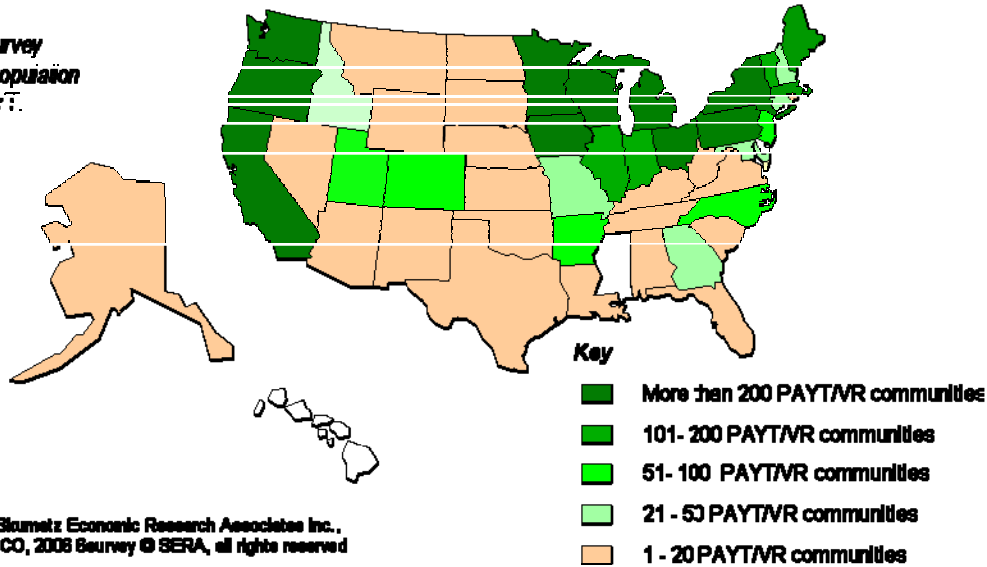
⁷ Note: Percentages for States with asterisks are based on share of communities that include CDPs, townships, and other extra communities and places. The PAYT community lists we compiled exceeded the smaller state census totals in those states otherwise. Those states might appear to have smaller shares of penetration than other states might. The population comparisons will provide additional information on "leading" PAYT states from another perspective.

Figure 1: PAYT / VR Community Counts by State in the US

PAY-AS-YOU-THROW (PAYT)/ VARIABLE RATES COMMUNITIES

SERA's 2006 survey found almost 7,100 PAYT/VR communities and only 2 states without programs

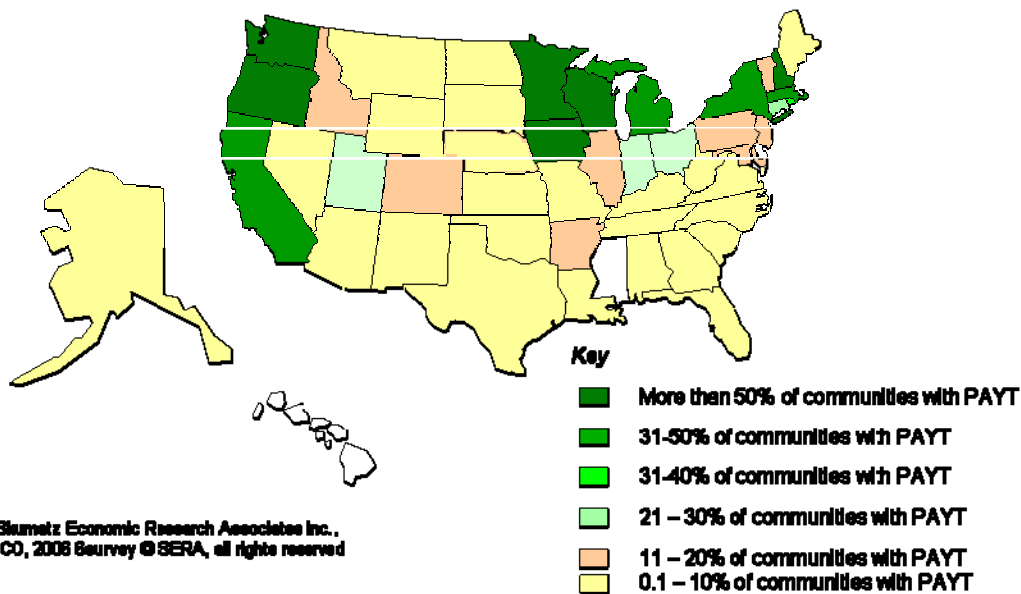
SERA's 2006 survey
Found 25% of population
Covered by PAYT.



Source: Skumatz Economic Research Associates Inc., Superior, CO, 2006 Survey © SERA, all rights reserved

Figure 2: PAYT / VR Community Percentages by State

PAYT / VARIABLE RATES COMMUNITY PERCENTAGES BY STATE

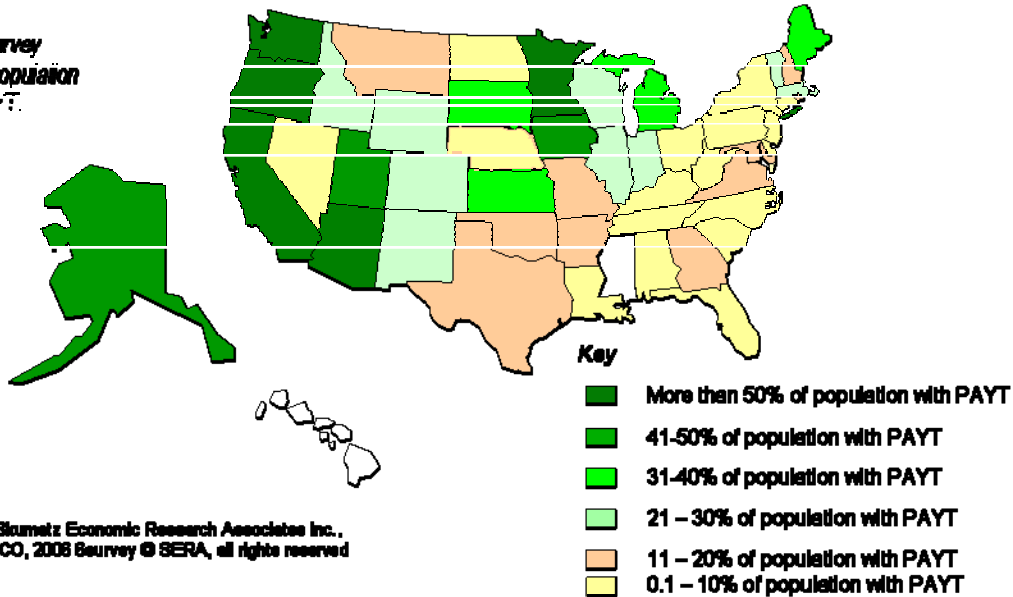


Source: Skumatz Economic Research Associates Inc., Superior, CO, 2006 Survey © SERA, all rights reserved

Figure 3: Percent of State Population with PAYT / VR Available

PERCENT OF STATE POPULATION WITH PAYT / VR AVAILABLE BY STATE

SERA's 2006 survey
Found 23% of population
Covered by PAYT.



Source: Skumatz Economic Research Associates Inc.,
Superior, CO, 2006 Survey © SERA, all rights reserved

Table 2. Growth in US PAYT Communities 1997-2006.

State	2006 PAYT Count	1997 PAYT Count	Increase	Pct Increase	State	2006 PAYT Count	1997 PAYT Count	Increase	Pct Increase	State	2006 PAYT Count	1997 PAYT Count	Increase	Pct Increase
AK	3	3	0	0%	LA	1	0	1		OH	243	208	35	17%
AL	2	2	0	0%	MA	139	87	52	60%	OK	2	0	2	
AR	80	8	72	900%	MD	49	49	0	0%	OR*	336	284	52	18%
AZ	5	3	2	67%	ME*	158	68	90	132%	PA	253	187	66	35%
CA	536	261	275	105%	MI	302	128	174	136%	RI	9	7	2	29%
CO	59	52	7	13%	MN*	1,850	867	983	113%	SC	13	1	12	1200%
CT	25	19	6	32%	MO	36	7	29	414%	SD	20	17	3	18%
DC	0	0	0		MS	0	0	0		TN	2	0	2	
DE	12	0	12		MT	14	1	13	1300%	TX	20	13	7	54%
FL	9	4	5	125%	NC	64	26	38	146%	UT	65	58	7	12%
GA	43	28	15	54%	ND	8	8	0	0%	VA	7	3	4	133%
HI	0	0	0		NE	18	0	18		VT*	180	160	20	13%
IA	539	201	338	168%	NH	45	24	21	88%	WA	522	426	96	23%
ID	25	18	7	39%	NJ	55	47	8	17%	WI	512	311	201	65%
IL	170	132	38	29%	NM	2	1	1	100%	WV	20	18	2	11%
IN	173	113	60	53%	NV	4	2	2	100%	WY	2	1	1	100%
KS	8	2	6	300%	NY	445	366	79	22%					
KY	1	0	1							Total	7,095	4,221	2,865	68%

2.4 Tonnage Impacts from PAYT

Key to the assessment of PAYT as an option for communities is identifying the impacts that can be expected when the program is introduced – specifically the tonnage and diversion impacts. This is trickier than it sounds, as most communities do not make changes in isolation. Changes in PAYT are usually accompanied by concurrent modifications in recycling programs, costs, outreach, or other changes. To provide specific results on effects attributable to PAYT requires statistical analysis to “control for” or “hold constant” differences beyond the PAYT change.

These effects were examined in a series of studies using information gathered from more than 1,000 communities.⁸ According to SERA’s research, the key impacts communities have found from implementing PAYT programs include reduction in disposal tonnage and an increase in recycling and yard-waste diversion as well as source reduction. These studies found that PAYT programs decrease residential MSW by about 17 percent in weight, with 8–11 percent being diverted directly to recycling and yard programs, and another 6 percent decreased by source-reduction efforts.⁹ The reports also found:

- 5–6 percent percentage points may be attributed to recycling (with similar increases for both curbside and drop-off programs);¹⁰
- 4–5 percent go to yard waste programs, if any;¹¹
- About 6 percent is removed as a result of source-reduction efforts, including buying in bulk, buying items with less packaging, etc.;¹²
- The impacts from PAYT were the single most effective change that could be made to a curbside (or drop-off) program. implementing PAYT had a larger impact on recycling than adding additional materials, changing frequency of collection, or other changes and modifications to programs;¹³ and
- These results are confirmed by other work. For instance, a survey in Iowa found that recycling increased by 30 percent to 100 percent after communities implemented PAYT (with an average of about 50 percent).¹⁴ When adjusted to the percent of the total waste stream instead of considering just increases in recycling, these results are very comparable to the SERA findings.

Specific MSW tonnage estimates are presented in Tables 3 and 4. Table 3 computes the residential tonnages affected by PAYT. Based on latest PAYT count conducted by SERA, PAYT programs are available to almost 75 million persons in the US.

⁸ Skumatz, Lisa A., Ph.D., “Nationwide Diversion Rate Study—Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies”, 1996. Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO.; and Skumatz, Lisa A., Ph.D. 1999. “Achieving 50 percent in California: Analysis of Recycling, Diversion, and Cost-effectiveness,” prepared for the California Chapters of Solid Waste Association of North America (SWANA) and Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO.

⁹ Lisa A. Skumatz, 2000. “Measuring Source Reduction: Variable Rates as an Example,” Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO. and Skumatz, Lisa A., Ph.D., “Nationwide Diversion Rate Study—Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies”, 1996. Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO.;

¹⁰ *Ibid.*

¹¹ *Ibid.*

¹² Skumatz, Lisa A., Ph.D., “Measuring Source Reduction: Pay As You Throw / Variable Rates As An Example”, Skumatz Economic Research Associates, Inc. Research Paper 2000-5; Superior, CO, May 14, 2000. These tons are diverted to recycling, composting, and source reduction.

¹³ Skumatz, Lisa A., Ph.D., 1996. “Nationwide Diversion Rate Study—Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies”, Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO.; and Skumatz, Lisa A., Ph.D., 1999. “Achieving 50 percent in California: Analysis of Recycling, Diversion, and Cost-effectiveness,” prepared for the California Chapters of Solid Waste Association of North America (SWANA) and Skumatz Economic Research Associates, Inc., Skumatz Economic Research Associates, Inc., Seattle, WA / Superior, CO.

¹⁴ Garth W. Frable and Michael Berkshire, 1995. “Pay-As-You-Waste: State of Iowa Implementation Guide for Unit-Based Pricing” East Central Iowa Council of Governments and Iowa Department of Natural Resources, Cedar Rapids, Iowa, January.

The computations below use the estimate of a population of almost 75 million (almost 25%) with access to PAYT, and use low and high generation estimates from the literature.

Table 3: Computation of US Residential Tonnage Covered by PAYT Programs¹⁵

Computation Element	Value
Population covered by PAYT (from this study)	75,000,000
Generation per capita low	0.82
Generation per capita high	1.47
Percent of tonnage residential (vs. comm'l)	43%
Tons residential affected - Low	26,445,000
Tons residential affected - High	47,407,500
Assumptions:	
Low generation based on EPA 2000 estimate of 4.5 lbs/cap/day = 0.82 TPY	
High generation based on Biocycle 2004 estimate of 1.47 TPY	
Percent of tonnage that is residential based on California CIWMB figures of 48.8% comm'l, 38.1% residential plus share of 13% self haul.	

We also estimate the tons diverted annually as a result of recycling, composting, and source reduction – and the total tonnage diverted from landfills. The figures, presented in Table 6, show that the current PAYT programs divert approximately 4.6-8.3 million tons of MSW from landfills annually. Note that the low and high assumptions for the computations derive from using a range of data to estimate the tons per capita generated annually.

Table 4: Computation of US Residential Tonnage Covered by PAYT Programs¹⁶

Computation element	Low	High
Residential tons affected	26,445,000	47,407,500
New tons to recycling (6%)	1,586,700	2,844,450
New tons to composting (5.5%)	1,454,475	2,607,413
New tons to source red'n (6%)	1,586,700	2,844,450
Total new tons diverted from Landfill	4,627,875	8,296,313
Midpoint	6,462,094	
<i>Assumptions: Diversion percentages based on Skumatz 2000)</i>		

Ultimately, PAYT can help reduce the burden on the disposal system and lead to more efficient resource use, reduced environmental burden, and lower long-run solid waste system management costs. The programs enhance community recycling and waste reduction programs. While these programs may not be appropriate in all communities, many communities can benefit from PAYT—and the discussions in this report can help communities examine the feasibility of PAYT for their solid waste system.

¹⁵ California Integrated Waste Management Board web site for figures on the percent of tonnage from residential, commercial, and self-haul sources.

¹⁶ Assumptions based on Skumatz, Lisa A., Ph.D., "Source Reduction can be Measured", *Resource Recycling*, August 2000. For additional information, see next footnote.

2.5 Effects of PAYT on Green House Gases and BTUs

The EPA's WASTE Reduction Model (WARM) model was used to estimate the effects of the growth of PAYT on green house gas (GHG) emission and energy conservation. The steps in preparing this computation included:

- Compute the WARM model results for a typical 100 tons of MSW, preparing baseline and alternative scenarios that would allocate tons based on approximate percentages that would be diverted. In this case, we assumed about 6% new tons would go to recycling, about 6% would go to composting, and about 2% would go to source reduction.¹⁷ The input assumptions are presented in Table 5.
- Compute the residential MSW tonnages affected by PAYT. These computations were provided in the previous section, assuming a population of 75 million has access to PAYT, and using low and high waste generation estimates from the literature.
- The WARM model was used to derive the carbon and BTU equivalents, using the information from Table 3 and Table 4 as inputs. These results are presented in Table 6.

Note that the low and high assumptions for the computations derive from using a range of data to estimate the tons of waste per capita generated annually.

The results (Table 5) show that, based on the computations of tonnages affected and the WARM model runs, the PAYT programs currently in place in the US are leading to reductions of:

- 2.1-3.8 million metric tons of carbon equivalents annually,
- 7.4-13.3 million metric tons of carbon dioxide equivalents annually, and
- 61-109 million MBTU annually.

The value of these reduced emissions can be valued. Specifically, the dollar value of the reduced emissions in terms of carbon dioxide equivalents can be estimated using prices from the Chicago Climate Exchange (CCX). As of late 2006, the CCX value for metric tons of CO₂ was about \$4.00-\$4.15.¹⁸ Given the estimated tons of emissions offset from Table 6, the value of the reduced emissions due to PAYT is on the order of \$30-\$55 billion dollars annually.¹⁹

Thus, PAYT has significant advantages beyond recycling and equity, including:

- High levels of source reduction;
- Recycling and yard-waste diversion impacts that provide significant progress toward meeting diversion goals (in a very cost-effective way).
- Environmental benefits in terms of greenhouse gas reductions, energy conservation, and consequently, pollution prevention, as well as
- Job creation and economic development benefits.²⁰

These additional benefits can significantly improve the payback from implementing PAYT programs.

¹⁷ This is a conservative assumption. A figure up to 6% for source reduction could be justified based on the literature. See Skumatz, Lisa A., Ph.D., "Source Reduction can be Measured", *Resource Recycling*, 8/2000, and Skumatz, Lisa A., Ph.D., ***Measuring Source Reduction: Pay As You Throw (PAYT) / Variable Rates as an Example, Technical report, prepared for multiple clients, included on EPA website, 5/2000.* A smaller figure (than 6% diversion) was used here because the WARM model restricts the categories of materials that may be modified through source reduction.

¹⁸ From www.chicagoclimatex.com. Other web sites like carbonfund.org and other suggested values of \$5.50, for example.

¹⁹ This figure was derived by multiplying \$4 per metric tonne CO₂E times 7,405 million metric tons of CO₂ and \$4.15 times the upper range from Table 6 of 13,274 million metric tonnes of CO₂.

²⁰ Research finds strong net positive economic and job creation multipliers compared to landfilling. Every switch of 1,000 tons from landfill disposal to (more labor intensive) recycling has economic effects multiplier of about 6:1, based on input-output analysis work conducted at the national level. EPA, "Resource Conservation Challenge, Campaign Against Waste," EPA 530-F-033, 2002. See also Skumatz, Lisa A., Ph.D., and John Gardner, 2006. "Auxiliary PAYT Effects Economic and Environmental Impacts", Skumatz Economic Research Associates, Inc., Superior, CO.

Table 5. Settings for WARM Model Runs to Estimate Energy and GHG Effects from PAYT²¹

	Step 1: Baseline Scenario - Tons				Step 2: Alternative Management Scenario			
	Generated	Recycled	Compostec	Landfilled	Source Red	Recycled	Composted	Landfilled
Aluminum Cans	0.400	0.000	0.000	0.400	0.022	0.072	0.000	0.306
Steel Cans	1.400	0.000	0.000	1.400	0.088	0.102	0.000	1.210
Copper Wire	0.300	0.000	0.000	0.300	0.020	0.280	0.000	0.000
Glass	4.000	0.000	0.000	4.000	0.175	1.404	0.000	2.421
HDPE	1.100	0.000	0.000	1.100	0.219	0.000	0.000	0.881
LDPE	0.800	0.000	0.000	0.800	0.194	0.000	0.000	0.606
PET	0.600	0.000	0.000	0.600	0.180	0.000	0.000	0.420
Corrugated	3.000	0.000	0.000	3.000	0.164	0.882	0.000	1.954
Magazines, 3rd	2.000	0.000	0.000	2.000	0.104	0.663	0.000	1.233
Newspaper	6.500	0.000	0.000	6.500	0.333	2.208	0.000	3.959
Office paper	1.700	0.000	0.000	1.700	0.080	0.663	0.000	0.957
Phonebooks	0.400	0.000	0.000	0.400	0.031	0.000	0.000	0.369
Textbooks	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dimensional Lumber	2.000	0.000	0.000	2.000	0.000	0.000	0.000	2.000
Med Dens. Fiberboard	0.300	0.000	0.000	0.300	0.000	0.000	0.000	0.300
Food Scraps	20.000	0.000	0.000	20.000	0.000	0.000	0.000	20.000
Yard Trimmings	2.500	0.000	0.000	2.500	0.000	0.000	1.008	1.492
Grass	5.000	0.000	0.000	5.000	0.000	0.000	2.202	2.798
Leaves	5.500	0.000	0.000	5.500	0.000	0.000	2.256	3.244
Branches	0.100	0.000	0.000	0.100	0.000	0.000	0.000	0.100
Mixed Paper	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mixed Paper (res)	13.800	0.000	0.000	13.800	0.000	0.000	0.000	13.800
Mixed paper (ofc)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mixed metals	2.500	0.000	0.000	2.500	0.000	0.169	0.000	2.331
Mixed plastics	6.300	0.000	0.000	6.300	0.000	0.000	0.000	6.300
Mixed Recyclables	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mixed organiccs	10.900	0.000	0.000	10.900	0.000	0.000	0.600	10.300
Mixed MSW	5.200	0.000	0.000	5.200	0.000	0.000	0.000	5.200
Carpet	1.000	0.000	0.000	1.000	0.067	0.000	0.000	0.933
PCs	0.500	0.000	0.000	0.500	0.034	0.000	0.000	0.466
Bricks	0.500	0.000	0.000	0.500	0.034	0.000	0.000	0.466
Aggregate	1.600	0.000	0.000	1.600	0.000	0.108	0.000	1.492
Flyash	0.100	0.000	0.000	0.100	0.000	0.007	0.000	0.093
Total Tons	100.000	0.000	0.000	100.000	1.745	6.558	6.066	85.631

²¹ Assumptions associated with these runs include: national average landfill characteristics, no combustion, and distance to landfills and processing facilities is 20 miles each.

Table 6: Computation of Carbon and BTU Impacts from PAYT Programs, annually per 100 tons, and for all PAYT-induced tons

Results from WARM Model Runs	Scen 1	Scen 2	NET Change	Results	Result
				Low (thous)	High (thous)
Metric tons of Carbon equivalent (MTCE)	8	0	-8	(2,116)	(3,793)
Metric Tons Carbon Dioxide Equiv (MTCO2E)	28	0	-28	(7,405)	(13,274)
Units of Energy (Million BTU)	41	-188	-229	(60,559)	(108,563)

Negative indicates REDUCTION

2.6 Analysis of Other PAYT Effects

Differences between PAYT and non-PAYT Communities

As part of this evaluation, we examined a recently-collected detailed database of more than 500 PAYT and non-PAYT communities. This database allowed us to examine a number of differences between PAYT and non-PAYT communities. Comparing average values for a host of demographic and programmatic features, we found PAYT communities had higher diversion rates.

- PAYT increases recycling: Recycling rates in non-PAYT communities were 4.3 percentage points higher in PAYT communities than non-PAYT communities.²²
- Yard waste diversion is higher: Yard waste diversion rates were 3.5 percentage points lower in non-PAYT communities compared to PAYT towns.
- PAYT increases diversion: Overall diversion rates were 5.8 percentage points lower in non-PAYT towns, compared to diversion rates in PAYT towns.²³

In addition, there were a number of patterns or apparent differences between PAYT and non-PAYT communities.²⁴ PAYT communities:

- Were wealthier, which higher values of median income and median housing value (indicator of wealth);
- Had a greater chance of being a college town or tourist town,
- Were more likely to be urban or mixed urbanization;
- Were more likely to have municipal garbage collection (as opposed to private haulers),
- Were more likely to have set a recycling or waste diversion goal,
- Were more likely to have a recycling program -- curbside or dropoff or both;
- Were more likely to have an electronics recycling program,
- Were more likely to embed their recycling fee in the garbage rate,
- Were more likely to sign households up for recycling service automatically,
- Were more likely to collect recycling weekly,
- Were more likely to collect recycling on the same day as garbage, and
- Were more likely to have curbside yard waste service.

We also used multivariate statistical modeling techniques to examine patterns in which communities were more likely to have PAYT. The most significant factors associated with a PAYT program included:

- Wealthier communities were more likely to implement PAYT;
- Suburban communities were less likely to implement PAYT than those in urban, rural, and mixed-urbanization;

²² This difference was statistically significant.

²³ This difference was statistically significant.

²⁴ Note that the only differences that were statistically significant were that PAYT communities: had higher percentage recycling and diversion rates, were more likely to have set recycling or diversion goals, were less likely to lack a recycling program, had larger recycling container volumes, less likely to have three-stream recycling, and less likely to have drop-off garbage collection systems,

- Those with high non-English speaking populations were less likely to implement PAYT.

Implications for Addressing Barriers to PAYT

This research indicates possible patterns in communities that have and have not adopted PAYT, and provides clues to the conditions that are more favorable for helping pave the way for PAYT.

- **Require Plans:** Encourage communities to establish recycling or diversion goals – whether through state or federal requirements, grants, or other strategies. PAYT communities were more likely to have implemented diversion goals – and the research shows PAYT provides significant progress toward reaching goals. Although many states require plans, these regulations are not currently in place in all states.
- **Encourage Development of Diversion Programs:** Non-PAYT communities were more likely to lack any recycling program opportunities.²⁵ Bringing (or requiring) some kind of recycling program opportunities to all communities and citizens provides a first step to the ultimate adoption of PAYT – a strategy that improves incentives for program use and the resulting performance of established programs.
- **Reduce Barriers:** Communities with municipal collection were more likely to have implemented PAYT than communities served by haulers. Certainly, it may be one step easier to implement PAYT if the community has direct control over the solid waste collection system; it may be worth investigating the primary barriers that haulers recognize from PAYT. Haulers repeatedly state they will do whatever the client wants, which implies that communities with contracted collection should be straightforward for PAYT implementation. In addition, haulers look for “level playing fields” in service; other communities may need ordinances requiring PAYT²⁶ or incentives or other strategies. Strategies for reducing barriers for recycling or increasing recycling participation include: costs for recycling embedded in the garbage fee (no separate fee); automatic sign-up for recycling, and good multi-lingual education, all of which seem to be other precursors to PAYT implementation.²⁷

Cost Differences Attributable to PAYT Programs

Communities often express concern that PAYT programs may increase garbage collection costs – either for administration, equipment/containers, or collection or other sources. To test this, we gathered data on the cost of garbage collection from PAYT and non-PAYT communities across the US. We used statistical models to examine differences in costs between PAYT and non-PAYT communities that are attributable to the PAYT system (beyond differences in demographics and other factors). We found that household costs for monthly garbage service were not significantly higher for PAYT communities compared to non-PAYT communities.²⁸ This concurs with earlier work in the states of Iowa and Wisconsin (Frable, 1994) that found that garbage costs stayed the same or decreased for two-thirds of the communities implementing PAYT. This is no doubt partly attributable to the fact that communities select their PAYT programs wisely – selecting a system that works well with their existing solid waste and recycling collection systems, helping manage costs of the change. And although education is a very important factor in a successful PAYT program, we found that – at least long-term -- education expenditures and staffing did not seem to be higher in PAYT communities.²⁹

In fact, the only factor that was consistently significant in affecting the per-household costs for garbage collection was whether or not the community had mandatory garbage collection for the residential sector (vs. optional subscriptions for service by households). Garbage collection costs were significantly lower in communities that had mandatory garbage collection – presumably because of the efficiencies of serving all households and the fact that equipment and administrative costs of the system could be spread across all households rather than only those signed up for service.

²⁵ and if possible, to establish yard waste programs, according to the statistical work.

²⁶ Ordinances requiring PAYT, reporting, and opportunities to recycle with costs embedded in the garbage fees are becoming more common in areas with competitive collection. Examples include areas in Colorado and elsewhere.

²⁷ It is not clear what form the barrier from having lower incomes in the community may take. It is possible grants, training, or other strategies may assist in helping move PAYT forward in these communities.

²⁸ The average monthly per-household cost for garbage collection ranged from about \$2.50 to more than \$20, with an average of about \$9-\$11 per household per month.

²⁹ These analyses were more complicated because cost variables were absent more often than others in the database. These effects are a focus for future data collection work.

Implications for Reaching Nationwide 40% Diversion Goals

The EPA has established a goal of reaching 40% diversion. Although PAYT can provide a significant boost toward reaching that goal, PAYT alone – even if put in place in 100% of all US communities – cannot push the US to the goal. However, PAYT, as part of a well-designed set of residential strategies can be responsible for a good share of progress toward this goal.

PAYT itself can be responsible for reducing about 16-17% of the residential materials delivered to the landfill. When added to the impacts from the recycling, yard waste, source reduction, and other diversion programs that make up comprehensive programs in the US, we find that a number of leading communities have achieved residential diversion levels on the order of 40% -60%. Some of the new programs instituting the “Fantastic Three” (the San Francisco / San Jose area), or for example, some of the programs alternating single stream recycling with curbside yard waste, using large curbside containers, are seeing reductions in this range or even higher. In each case, well-designed PAYT incentives are a key element to the success of the overall program.

However, recall that in most communities, the residential sector represents only 40-60% of the total MSW disposed, depending on the community. Even if it were possible to develop well-designed recycling, source reduction, education, and revised manufacturing and product responsibility strategies that could get residents to 100% diversion (zero waste), it might just be possible to reach 40%. First, that would not wholly be due to PAYT, and second, this would not be the most socially cost-effective method of reaching 40%.³⁰

Research on the costs of reaching higher and higher levels of diversion confirms the logical assumption that reaching aggressively high levels of diversion is more expensive than low to medium levels – the “cream skimming” portion of diversion program design.³¹ Let us simplify for the sake of this discussion, and assume that the residential sector is 50% of generation and 50% is commercial / industrial. Extrapolating from the cost research discussed above, reaching 80% recycling in the residential sector (which would lead to 40% diversion overall) would almost certainly be more expensive (to generators, haulers, and society) than reaching 40% in each sector. There are a number of factors that drive where the optimum would be for diversion between the two sectors,³² but there are a several suggestions that can be taken into account in trying to reach 40% diversion at the community and national level:

- PAYT cannot account for all of the impacts to 40%; however, it can represent a key part of successful residential strategies that achieve high diversion levels.
- Even if communities do not have a great deal of direct control over the commercial sector, various ordinances, incentives, and programs geared toward developers / builders, business /building owners, haulers, and others³³ can lead to significant increases in non-residential diversion.

A diversified approach – looking at high-performing, cost-effective strategies in both the residential and commercial sectors can help communities and the nation move toward the 40% diversion goal.

³⁰ In addition, strategies may be needed for the multi-family (MF) sector, which is a difficult sector to reach. Some communities have implemented ordinances requiring recycling access for all MF buildings; others have used hauler financial incentives. For additional information, see Skumatz, Lisa A., “Reaching for recycling in multi-family housing”, *Resource Recycling*, October 1999, and its source material.

³¹ See Skumatz, Lisa A., Ph.D., “Achieving 50% in California: Analysis of Recycling, Diversion, and Cost-Effectiveness”, Skumatz Economic Research Associates, Inc., prepared for California Chapters of SWANA, April 1999.

³² Given differences between the two sectors, it is unlikely that 40% from each sector is the low-cost optimum; but whether it is cheaper to get 50% from one and 30% from another, and which direction that optimum might be (more from residential or more from commercial) may be driven by a variety of factors related to markets, programs, control over sectors, homogeneity / heterogeneity of the sectors and programs, size of the sectors, types of business in the community, and many other factors.

³³ For suggestions, see Skumatz, Lisa A., Ph.D., “Seven Steps to Increase Recycling Cost-Effectively”, *MSW Management*, September/October 2002”, or Skumatz, “Increase diversion cost-effectively” a four-part series, *Resource Recycling*, August 2002-October 2002, or Skumatz, Lisa A., “Recycling and the commercial sector”, *Resource Recycling*, December 2001, among others.

3. PAYT IMPLEMENTATION ISSUES AND CASE STUDIES

3.1 PAYT Advantages and Concerns

PAYT or variable rates programs provide a number of advantages for communities and residents:

- **Equity.** PAYT programs are fair: customers who use more service pay more.
- **Economic Signal.** Under PAYT, *behavior* now affects a bill, regardless of what disposal choices a household made. Without PAYT, avid recyclers paid the same as large disposers. PAYT provide a recurring economic signal to modify behavior, and allows small disposers to save money compared to those who use more service (and cost the system more).
- **Lack of Restrictions.** PAYT does not restrict customer choices. Customers are not banned from putting out additional garbage; but those who want to put out more will pay more.
- **Efficiency.** Variable-rate programs are generally inexpensive to implement and, unlike recycling programs, do not require additional pick-up trucks. They also help prevent overuse of solid-waste services. Rather than fixed buffet-style charges, which encourage overuse of the service, volume-based rates encourage customers to use only the amount of service they need.
- **Waste Reduction.** Unlike recycling programs alone, which only encourage recycling, PAYT reward all behaviors—recycling, composting, and source reduction—that reduce the amount of garbage thrown away. Source reduction is the cheapest waste management strategy and thus of the highest priority—and it is not directly encouraged by recycling and yard waste programs.
- **Speed of Implementation:** Pay-as-you-throw programs can be very quickly put in place—one community installed a PAYT program in less than three months (although most take longer).
- **Flexibility.** “Pay-as-you-throw” programs can be implemented in a variety of sizes and types of communities, with a broad range of collection arrangements.
- **Environmental Benefits.** Because they encourage increased recycling and waste reduction, PAYT programs are broadly beneficial to the environment.

However, there are also concerns about PAYT programs. The most frequently mentioned include:

- **Illegal dumping:** Research³⁴ shows illegal dumping is a bigger fear than reality³⁵, and is a problem in about 20% of communities – a problem that lasts about 3 months or less. Further, analysis of the composition of illegally dumped material finds only about 15% is household in origin and that the largest household component is bulky items or appliances (or “white goods”). Enforcement of illegal dumping ordinances usually keeps the problem at bay. PAYT programs should make sure to introduce methods for getting rid of occasional bulky materials through stickers, payments, appointments, or other methods.
- **Concerns about large families or the poor:** Large families pay more for groceries, water, and other services they use more than other households, and PAYT basically extends this to trash service. Note that large families have opportunities to reduce trash through recycling – opportunities that are not as readily provided in the use of food! Consider the converse of the argument – is it fair for small families on fixed incomes (retirees) to subsidize large disposers (whether or not they are large families)? On the low income issue, in some cases, communities provide

³⁴ Skumatz, Lisa A., Ph.D., Hans Van Dusen, and Jennie Carton, “Illegal Dumping: Incidence, Drivers, and Strategies”, Research Report Number 9431-1, Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO, November, 1994.

³⁵ It scores much higher as “concern” than real effect after the fact. For more information see Skumatz, Lisa A., Ph.D., 2001 “PAYT: Frequently Asked Questions”, Skumatz Economic Research Associates, Inc., website, www.serainc.com, Superior, CO.

"lifeline" discount rates for essential services like energy and telephone, etc., and these types of discounts can be extended to garbage fees through discounts or allocations of some free bags / tags. Special arrangements for poor or infirm are made in less than 10% of the communities with PAYT, but are included in communities with policies for other services.³⁶

- **Revenue uncertainties:** The number of bags or cans of trash set out decreases dramatically with PAYT – due to reduced disposal AND stomping or compaction. Communities and haulers implementing PAYT need to adjust their expectations about the number of set outs in order to assure they cover the fixed costs of collecting solid waste. In addition, rate structures that are very aggressive can exacerbate the revenue risk issue, so "can is a can" rates can make it riskier to recover costs. Research indicates most of the recycling incentive is maintained even if the full cost differentials are 80% more for double the service.³⁸
- **Administrative burdens / work loads:** Studies in Wisconsin and Iowa³⁹ indicate that workloads stayed the same or decreased in 60-70% of the communities implementing PAYT. Workloads during implementation will be increased (including calls) and temporary staff are likely to be needed.
- **Multifamily buildings:** PAYT is most tested in single family situations up to perhaps 8-unit apartment complexes. They are not widely tested in large multifamily buildings (with chutes), although some technologies are being developed.⁴⁰ However, multifamily buildings serviced by dumpsters receive a better volume-based building-wide incentive for recycling than single family household with a non-PAYT system. The lesson is that PAYT should not be held up because it doesn't yet apply well to the multifamily sector.

Key Facts about PAYT / User Pay

PAYT programs are in place in almost 7,100 communities in North America, available to about 25% of the population.

PAYT is fairer than tax-based systems – and after implementation more than 95-98% of households prefer the new system.

PAYT reduces residential trash disposal by one-sixth (about 17%). Analysis shows about one-third (6%) shows up as increased recycling, about one-third (5%) as increased composting, and one-third (6%) is "source reduced" or avoided generation (buying in bulk, etc.)

Implementing PAYT is the single most effective thing a community can do to increase the diversion from curb-side OR drop-off programs.

Concerns about illegal dumping seem more fear than reality. Problems arise in fewer than 1 in 5 communities, and usually last less than 3 months.

While significant differentials in rates between different can sizes are an important incentive, twice as much service does not need to cost twice as much in order to provide an incentive – a differential of 80% seems to generate most of the diversion impacts associated with more aggressive rates.

Political issues are the main barrier in PAYT – technical issues (litter, equipment, administration, haulers, etc.) are rarely a bother and have solutions from around the nation.

The easiest form of PAYT to implement is the hybrid system, which uses current collection and billing methods, but puts a cap on the amount of trash allowed for the bill. Any additional set outs require extra fees – an incentive – through a bag, tag, or sticker system.

A variation on the weight-based system, called "RecycleBank™" has shown promise in areas where PAYT has been hard to implement politically. Instead of weighing trash and charging more, the system weighs recycling by household and provides rewards and coupons at participating stores. It can be implemented with or without one of the PAYT options.³⁷

Source: Skumatz Economic Research Associates, Inc. (SERA) research

³⁶ Skumatz, Lisa A., Ph.D., 1995. "How Can Low Income Programs Work? Addressing Special Populations Under Variable Rates Systems", Research report 9508-1, Skumatz Economic Research Associates, Inc., Seattle WA / Superior CO.

³⁷ The RecycleBank™ option provides a useful reward, and doesn't require a change in garbage collection or billing as it solely affects the recycling program / system. However, one caveat is that it rewards only recycling; PAYT rewards composting, re-use, source reduction, and recycling.

³⁸ Low differentials don't provide a noticeable incentive, and if higher differentials won't be supported, then the PAYT system should not be implemented. For more information see Skumatz, Lisa A., Ph.D., 2001. "PAYT: Frequently Asked Questions", Skumatz Economic Research Associates, Inc., website, www.serainc.com, Superior, CO.

³⁹ Garth W. Frable and Michael Berkshire, "Pay-As-You-Waste: State of Iowa Implementation Guide for Unit-Based Pricing" East Central Iowa Council of Governments and Iowa Department of Natural Resources, Cedar Rapids, Iowa, January 1995.

⁴⁰ Skumatz, Lisa A., Ph.D., 1999. "Reaching for recycling in multi-family housing", (analyzing suggestions for incentives and progress in getting past collection barriers in MF), *Resource Recycling*, October.

Ultimately, it is anticipated that using PAYT to reduce the burden on the disposal system will lead to more efficient use of services, reduced burden on the disposal system, improved environmental and resource use, and lower long-run solid waste system management costs.

3.2 PAYT Legislation and Ordinances

Although PAYT has spread on a community-by-community basis, other states have felt the advantages were strong enough to encourage PAYT more formally. A number of states in the US – as well as counties and cities – have implemented legislation or ordinances to require PAYT. State legislation or involvement has taken the following forms, as shown in Table 7.⁴¹

Table 7: State and Local Approaches to PAYT Legislation

Summary of State (and Local) Approaches to PAYT (Source: Skumatz, SERA 2004)	
<ul style="list-style-type: none"> • Mandatory: all communities (or haulers) must implement PAYT (2 states). • Mandatory if goals not met: several states require communities that do not reach 25% or 50% diversion by other means must implement PAYT (2 states). • Requirements to adopt subset of menu strategies with PAYT as one option (1 state) • Other state approaches, including financial incentives (grants for PAYT), active promotion (education / workshops about PAYT), or voluntary recommendations (states that put PAYT into State Master Plans or Comprehensive Plans). 	<ul style="list-style-type: none"> • Local / County PAYT Ordinances: Counties or cities have also implemented legislation requiring PAYT for haulers operating in their jurisdiction. This can be a successful way of getting PAYT in place – and haulers seem willing to cooperate as long as the system implies a level playing field for all haulers.⁴²

The most promising and flexible options seem to be: local ordinances leveling the playing field, and systems that require PAYT for communities that have not met diversion goals – but key aspects of legislation as noted in the highlighted box below should be incorporated.⁴³

3.3 Getting PAYT Implemented in Communities

Getting PAYT programs approved is often harder than designing and running the actual system. City councils are sensitive to concerns about not fixing things that are not broken. One city council, for example, approved PAYT pricing as a concept, but left it for the next council to deal with the issue of the actual rates to be charged. The most important issue is to provide information to residents, the press, and stakeholders about the purpose of the change, what the community hopes to achieve through the change, and how to make the program work for residential customers.

In addition to the three steps recommended earlier in this report (requiring plans, encouraging development of programs, and removing barriers), past analysis indicates there are several key strategies and activities that may be useful in helping communities move in this direction.⁴⁴

⁴¹ Skumatz, Lisa A., Ph.D., 1998. "Model Variable Rates Legislation: Elements, Options, and Considerations in State-level Legislation in Solid Waste," Research Report 9599-1, Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO. This report also includes recommendations on effective state-level legislation and initiatives.

⁴² Haulers repeatedly make it clear they will do what their customers want. They are willing to compete under a variety of situations – as long as the same rules apply to all haulers.

⁴³ Skumatz, Lisa A., Ph.D., 1998. "Model Variable Rates Legislation: Elements, Options, and Considerations in State-level Legislation in Solid Waste," Research Report 9599-1, Skumatz Economic Research Associates, Inc., Seattle WA / Superior CO.

- **Political Support.** One of the most important elements of success is gathering political support for a PAYT program. A champion for the system on the Council can be especially effective. Support from citizen groups can help.
- **Hauler Input.** Haulers should be included in the discussion the design of a PAYT system. PAYT programs are not unfamiliar to haulers—and haulers know the community and can help design and revise the system so that it can work better for all involved parties. Haulers can often make very useful suggestions that accomplish the same goal and make the program work more smoothly.
- **Customer Education.** It is critical to provide information about the new PAYT system to households. Address the problem solved by the new system, how the system works, opportunities to reduce waste, and where to get more information.⁴⁶
- **Consider a pilot or phased implementation:** This can help make sure the program has minimal glitches when implemented system-wide.

Key components of PAYT Legislation and Ordinances⁴⁵

A number of key elements should be included in PAYT legislation and ordinances to help ensure a successful program and increase recycling:

- **Embedded fees and access for recycling:** *include language requiring that curbside containers be provided for all households, and that the costs be embedded into the garbage fee. This does not require the service be available for no cost – it would be assumed the costs of garbage would be adjusted to cover the cost.*
- **Can size:** *Make sure that the language requires that a small trash container be available – and that it be no larger than 35 gallons. Larger containers would also be available. With bags or stickers, make sure a small bag of approximately this size is available for small-volume disposers.*
- **Incentive levels:** *One state requires that the rates for increments of garbage service must vary with the amount of service provided. The language is moot on whether that means volume or weight (most haulers pick weight because it varies less). One possible arrangement is to suggest rates would be (no less than) 70 or 80% higher for double the service. Small differential do not provide recycling incentives and are not worth implementing PAYT. This does not “set” rates for the haulers, but achieves key incentive objectives.*
- **Education and Reporting:** *Requiring periodic education by haulers can help make a successful PAYT program; cooperation between haulers and communities may be even more successful. In addition, communities should require reporting of garbage and recycling tonnages to assist in tracking progress and impacts.*

3.4 Case Studies

The following case studies show some of the range of communities and designs for PAYT programs that have been implemented in the US – along with implementation tips from the communities themselves. These examples illustrate how effective PAYT can be – and how they can adapt to a range of community situations. The case study communities were chosen foremost for their high diversion rates. However, the cities were selected for other criteria as well, including geographic diversity, size variations, and type of PAYT program. They range in population from 43,000 to 1.5 million and geographically from Massachusetts to Washington, demonstrating that PAYT can be successful regardless of location or size. All of the cities achieve high diversion and do so with different types of PAYT, but all share a program that

creates economic incentives based on usage to effectively reduce residential garbage and increase residential recycling and source reduction. All five cases use a different means to achieve a common end. By looking at each individual case, one is able to glimpse the flexibility and diversity available in PAYT programs to obtain optimal diversion.

Attleboro, Massachusetts

Attleboro is unique in this set of cities in that it has the smallest population and is the most recent to install its PAYT program. They implemented the program on July 1, 2005, as their previous trash collection contract was expiring. The city council had

⁴⁴ Skumatz, Lisa A., Ph.D., 2000. PAYT / Variable Rates Manual – 4 volumes (overview, implementation/education, surveys, rates calculation manuals), Skumatz Economic Research Associates, Inc., Superior, CO, November, and Skumatz, Lisa A., Ph.D., 1993. Variable Rates for Municipal Solid Waste: Implementation Experience, Economics, and Legislation, Reason Foundation Policy Study No. 160, Los Angeles, CA. June.

⁴⁵ Skumatz, Lisa A., Ph.D., 1998. “Model Variable Rates Legislation: Elements, Options, and Considerations in State-level Legislation in Solid Waste,” Research Report 9599-1, 1995 updated 1998, Skumatz Economic Research Associates, Inc., Seattle WA / Superior, CO.

⁴⁶ Skumatz, Lisa A., Ph.D., 2001. Evaluating the impact of recycling education”, Resource Recycling, August.

failed to support proposals to implement PAYT twice previously but approved it in 2005, after a cost/benefit analysis demonstrated that unlimited trash pick-up would increase residential fees by \$60/year with a subsequent 15% annual increase, and the PAYT system would only raise the fees by \$30/year with no subsequent increase. After adoption of the program, the fees actually decreased by \$6/year for the second year. This fee decrease was due to the 36% increase in recycling that the town experienced, coupled with the decrease of 2,587 tons of garbage collected. Attleboro does not have to pay for the disposal of recycling, only garbage, and with a decrease in garbage tonnage they were able to lower the user fees.

The system Attleboro chose to implement is a hybrid bag system. For a monthly fee of \$15.00 the residents can dispose of 36-gallons of trash weekly, and unlimited dual-stream, curbside recycling. If they exceed their prescribed limit they can purchase additional 36-gallon bags, available in 5 packs for \$7.50 or \$1.50 each. Cheryl Perry, the recycling coordinator, asserts that PAYT has, without a doubt, increased diversion and references the decreased garbage collected and increased diversion to emphasize her point. The current diversion rate in Attleboro is 44% with annual collection of 11,400 tons of garbage, 4,000 tons of recycling, and 4,854 tons of yard waste. The average household under the former unlimited pick-up disposed of 3 barrels of trash and 1 container of recycling, it is now reversed to 1 barrel of trash with 3 containers of recycling.

The largest obstacle Attleboro faced in PAYT was garnering the political support to push it through. It took an increase in rates from the haulers in their bid for unlimited pick up for the town council to finally approve the change. To ease the transition, the town sent multiple educational mailers to residents and has had 34 articles regarding the new system printed in the local paper. Still, Ms. Perry cites education about the new system as one of the largest barriers. There was some criticism from residents in the very beginning about not knowing about the switch to PAYT, or not purchasing the correct size barrel, but now the residents "seem quite happy about it", especially with the drop in rates. When asked what advice she could give to other cities trying to start up a similar program Ms. Perry replied, "Keep trying! It took us three times in front of the city council, but now that it is approved it is very successful."

Dubuque, Iowa

Dubuque was awarded the 2006 Outstanding Curbside Collection award from the state of Iowa for their PAYT and recycling program. They are now in their fourth year of PAYT since the 2002 implementation, and are realizing significant progress in both diversion increases and garbage collection decreases. They collect from 20,000 households and offer multiple systems of PAYT for residents to choose from. There is a hybrid bag/tag option where the residents have a flat \$8.70 monthly fee for one 35-gallon container, with a second container adding \$5.00 a month. Or residents can use a 50-gallon container for \$10.70/month with an additional 50-gallon container being \$7.00 month. In both cases residents can purchase tags for additional bags for \$1.20 each. These are the most popular systems used in town. They also offer fully automated tipper carts, with 64 gallons at \$18.50/month and 96 gallons at \$27.00/month. Four-stream recycling is included in all choices. Dubuque has achieved a 30% increase in recycling tonnage and a 28% decrease in garbage tonnage since the inception of their program. They now collect 10,200 tons of garbage, 4,800 tons of recycling, and 1,800 tons of yard waste to attain a 40% diversion rate.

When Dubuque switched over they expected to run into some problems but staff said they were "amazed at how well it worked." The only chronic problem they deal with now is with newcomers to the city. When new residents move in they are often "mystified" with the PAYT, but once they are educated about their choices and options, they realize the benefits of the program. If a resident becomes a chronic abuser, consistently putting out too much trash, the city gives them "three strikes". If the haulers tag the household three times, the resident is charged double for collection service until they comply.

Dubuque has also taken an innovative step to address the issues of elderly, large, or underprivileged families. They offer a 50% discount on the monthly fee to low income families of five or more, low income elderly, and households meeting Section 8 federal assistance guidelines. There are also exceptions made for "hardship cases" approved by the city manager. Paul Shultz, the town recycling coordinator, wants to get across the message that PAYT is " basically a sin tax. If you waste more, you pay more. We do not have the right to waste material and we can use economic incentives, not just education, to create a behavioral change in society."

Boulder, Colorado

As the result of a city wide ordinance to increase recycling, Boulder switched to PAYT in 2001. The ordinance required that all haulers providing service in Boulder incorporate PAYT. They can set their own prices but it must include curbside recycling. Within the first year of adopting PAYT, Boulder went from 70% of households disposing of two or more containers of trash to the vast majority disposing of 32 gallons or less. This increased city wide residential recycling from 17% to 34% in the first year. Boulder now diverts over 50% of its residential solid waste. Western Disposal, which collects using fully-automated trucks, is the primary hauler, and the rates charged by this hauler follow. A 32-gallon can costs \$20.55/month, 64 gallons of service cost \$31.40/month, and 96 gallon can service costs \$41.15/month. The hauler also offers prepaid 32-gallon trash bags for \$2.30. In 2005 Boulder collected 12,000 tons of trash, 9,800 tons of recycling, and 125 tons of yard waste, a diversion rate of 45%. This year Boulder has piloted a single-stream recycling program with alternate weekly yard waste collection which has shown a 56% diversion rate.

When the city first switched, the largest problem was with residents complaining that the new containers were "ugly and too big". However, after only one month of PAYT service this problem dissipated and residents became used to the new containers. Western Disposal was able to alleviate the problems by hiring extra help in the first few months to staff the phone lines and answer residents' questions. Like the other cities, the largest problem in Boulder is education. When new people move into town they are skeptical, but after they learn how PAYT works they have no complaints. Gary Horton, of Western Disposal, said that an innovation they have used to increase recycling and decrease contamination is placing large stickers on the inside of the recycling bins to show customers what they can and cannot recycle. Boulder exemplifies how a city and haulers can function together well to meet their varied goals. Mr. Horton mirrored this sentiment in an interview saying, "Communities can work together with haulers to change the ground rules and it is time to change them. Everyone needs to recycle and cities should use their regulatory powers to make it happen."

Case Studies:

Attleboro, MA.

- Population-43,600
- Started PAYT 2005
- \$15.00/month flat fee for 36-gal/wk and \$1.50 for additional bags.
- Increased recycling by 36% and decreased garbage to achieve a 44% diversion rate.

Dubuque, IA.

- Population-60,000
- Flat fee \$9.44 a month with options for hybrid bag/tag or variable rate cans.
- 30% increase in recycling tonnage and 28% decrease in garbage since implementation, now have a 40% diversion rate.
- Offer discounts for Section 8, large, elderly, and low income families.

Boulder, CO.

- Population-83,400
- Began PAYT in 2001
- City ordinance requires PAYT offered by haulers.
- Variable can rates for 32, 64, 96- gallon cans and fixed fee bags available.
- Recycling increased from 17% in 2001 to 34% in first year of PAYT, now divert over 50% of solid waste.

Fort Collins, Colorado

Although Fort Collins does not reach the high diversion rates of some of the other case study cities, it is worthy of closer inspection due to its collaboration between the city and the multiple haulers serving the city. In 1991 Fort Collins passed an ordinance requiring haulers to provide curbside recycling but due to the increased cost of such a service, most customers did not participate. In response, the city council then passed an ordinance in 1995 to require all haulers to provide curbside recycling at no extra charge, and to apply volume-based rates to be implemented. Unlike Boulder, which in effect is only served by one hauler, Fort Collins had six private companies ranging from national players to locally owned and operated businesses, which posed a serious challenge to the city environmental planner. The current average sizes and monthly rates among the multiple haulers are: 32-gal/wk of service for about \$10.00, 64-gal/wk for about \$13.00, 96-gal/wk for about \$17.00 per month, with pre-paid bags sold for about \$1.20 to allow some residents to drop below 32 gallons of service weekly. Approximately 90% of the households are now participating in the recycling program, up from 53.5% before the PAYT system was implemented. The city currently diverts at least 27% of its solid waste and has a goal of 50% diversion for 2010.

When the PAYT rates with "bundled" recycling were first implemented there was strong resistance from the haulers. After working closely with them, the city agreed to amend the ordinance to respond to haulers' concerns about charging strictly for volume; haulers were given the option of applying a monthly flat fee as long as it does not exceed 50% of the trash bill. From a practical standpoint, the haulers appreciate that the volume based system allows them to charge more for the extra trash. Like

the other cities, Fort Collins spent a fair amount of time during the first 6 months with education and fielding citizens' calls, but now there is a very positive response from residents for the PAYT program. The town maintains that the most important feature of the program is to reward people with cost savings for reducing their waste.

Vancouver, Washington

Vancouver has had a city wide ordinance addressing solid waste since 1943. In 1996, when they renewed hauler contracts, the city implemented a PAYT system. Along with offering various sizes of cans for pick-up, they also offer options in frequency of collection. When they switched to the larger carts, some residents felt that they did not need weekly pick-up and the city worked to develop other options. Vancouver is now one of the few cities in the country that offers every-other-week collection along with their weekly and monthly options. The monthly rates for weekly collection are as follows: 20-gal/\$12.92, 32-gal/\$16.35, 64-gal/\$30.07, and 96-gal/\$43.79. Every-other-week collection costs 20-gal/\$10.86, 32-gal/\$12.92, and 64-gal/\$16.35. Vancouver does not have accurate data for diversion rates before the change, but the recycling coordinator, Richard McConahay, believes that PAYT "definitely increases recycling; it provides a real incentive to recycle." They collect 39,000 tons of garbage annually, 14,700 tons of recycling, and 12,750 tons of yard waste for over 40,000 households. They are currently diverting 50% of their solid waste.

In 1997 the city doubled its collection area to include rural areas on the outskirts of town and ran into problems with residents who previously had no collection now being forced into mandatory pick-up. Vancouver was able to alleviate this problem by increasing the number of options and rates offered, allowing for all families, regardless of income, to find a rate that works for them. They are currently attempting to address the issue of large, low income families, and are looking into offering an exemption status to those that qualify. Mr. McConahay had this advice to offer those planning on implementing PAYT: "Be clear in what you are doing and allow for some flexibility in rates and service."

Case Studies:

Fort Collins, CO

- Population-140,000
- Began PAYT 1996
- City worked in close unison with multiple haulers to establish volume based rates
- Average of 3 sizes offered, 32,64, and 96-gal from \$10 to \$17/month

Vancouver, WA.

- Population-155,500
- Started PAYT in 1996
- Offer PAYT for cans on weekly schedule as well as every-other-week and monthly collection.
- Diversion rate of 50%

3.5 PAYT in the Largest US Cities

A detailed analysis of PAYT in the largest 100 cities was conducted. The study found that PAYT programs were in place in 30 of the top 100 cities – which comprises those US cities with populations of approximately 190,000 and more. A number of patterns between PAYT and non-PAYT communities were found. In general, PAYT communities were wealthier, and had implemented more aggressive waste diversion activities on other fronts than just PAYT. Specifically, we found that among the largest cities, the PAYT communities had⁴⁷:

- Higher incomes and wealth than in non-PAYT communities – on the order of 35% higher for housing values, and 18% higher incomes.

⁴⁷ Given the sample sizes associated with this analysis (30 PAYT and 70 non-PAYT communities) few of these difference patterns are statistically significant. Some that were significant included: PAYT communities were less likely to have a high percentage of non-English speakers, and PAYT communities had more gallons of recycling service. Note that similar patterns also showed up in an examination of differences between PAYT communities and non-PAYT communities beyond just the largest cities (see Section 2.6 to see more on these types of topics beyond the largest communities). Specifically, we found higher values in sets of PAYT communities (large and small) for: median income and median housing value (an indicator of wealth); chance of being a college town or tourist town, more likely to be urban or mixed urbanization; more likely to have municipal garbage collection (as opposed to private), more likely to have set a recycling or diversion goal, more likely to have a recycling program -- curbside or drop-off or both; more likely to have an electronics recycling program, more likely to embed their recycling fee in the garbage rate, more likely to sign households up for recycling service automatically, more likely to collect recycling weekly, more likely to collect recycling on the same day as garbage, and more likely to have curbside yard waste service.

- Smaller populations -- PAYT is going in among the smaller of the largest cities, with the average population for PAYT communities in the largest 100 cities is 385,000, and for non-PAYT communities the average populations is 645,000.
- Slightly higher shares of single family (vs. multi-family) households (53% vs. 62%)
- A significant university population (almost twice as likely to be a university town)
- Less frequent garbage collection (more likely to have weekly vs. twice weekly collection)

Clearly, PAYT communities are also those cities that have implemented significant other recycling activities. Large cities with PAYT programs are more likely to have implemented (or be in states that have implemented):

- Advanced disposal fees (ADFs) on some commodities (more than five times as often compared to non-PAYT cities)
- Beverage container deposit requirements or "bottle bills" (three times more common)
- Construction and demolition (C&D) programs (more than twice as common)
- Mandatory recycling programs (almost twice as common)
- Landfill bans on some commodities (slightly more common)
- Curbside recycling programs (somewhat more common -- 27% vs. 34%)
- Curbside programs earlier -- PAYT communities had older curbside recycling programs (12 years vs. 16 years old)
- Electronics recycling programs (twice as likely to have some kind of curbside collection, and about one-third more likely to have drop-off programs)
- Embedded fees (i.e. no separate charge) for the recycling program (one-third more likely)
- Pilot or full-scale food waste programs (more than three times as likely)
- Recycling programs with larger recycling containers (twice as many gallons of service per week, on average)
- Program that include significant multifamily housing types in the recycling program (almost twice as likely)
- Curbside recycling programs that collect more materials (8.1 vs. 9.5 commodities).
- Programs in which all households automatically receive recycling containers (50% more likely)
- Systems allocating the lead responsibility for recycling education to the City (vs. haulers) (about 40% more likely)
- Programs with single stream collection (50% more likely)
- Programs that collect recycling and garbage on the same day (25% more likely)
- Curbside yard waste programs for residents (30% more likely)
- Curbside yard waste programs that operate year around vs. seasonally (13% more likely).

Both PAYT communities and non-PAYT communities show similar results for the percent of population that speak English as a second language or are non-English speaking. They collect about the same number of materials at drop-off centers. The two groups report very similar tipping fees for disposal -- about \$33 / ton. Being a tourist destination city (with their transient populations) has not proven a barrier to PAYT (about 15% of the cities self-classified as tourist communities).

Most importantly, the recycling and diversion rates between the two sets of communities were higher in PAYT cities than non-PAYT communities:⁴⁸

- Recycling diversion was 11% vs. 14% in PAYT cities (3 percentage points or 25% higher);
- Yard waste diversion was 13% vs. 17% (4 percentage points or 30% higher), and
- Overall diversion was 26% vs. 32% (6 percentage points or 23% higher).

⁴⁸ These differences in diversion rates were not statistically significant; it is easier to show differences with larger sample sizes, and we were limited to 30 and 70 for PAYT and non-PAYT communities in this sample. Note that the analysis of a larger sample of PAYT communities (Section 2.6 of this report) found significant differences in both recycling (4.3 percentage points) and overall diversion (5.8 percentage points) rates.

3.5.1 What do the Large City PAYT programs look like?

Garbage Collection, System, and Disposal

In large cities, garbage is most often collected by the municipalities; however, among PAYT cities it is a smaller proportion and they are incorporating more options for who collects the garbage. Comparing PAYT to non-PAYT cities we find:

- 64% of PAYT cities use municipal staff (82% for non-PAYT)
- 14% use one hauler, by contract (11%)
- 9% offer multi-hauler franchise (6%)
- 5% use multi-hauler contracts, licensing/permitting, or are single-hauler franchised (2%)

PAYT cities use fully automated collection slightly more often than cities without PAYT programs and non-PAYT cities are more likely to use manual collection. For PAYT compared to non-PAYT communities, we find garbage is collected as follows.

- 76% fully automated (66% for non-PAYT)
- 29% manual (49% for non-PAYT)
- 21% semi automated (36% for non-PAYT)

Almost all of the PAYT cities have once weekly collection and only one offers twice weekly collection. Among the non-PAYT cities, over one third of them have twice weekly collection (with the remainder collected once weekly).

We also examined transfer station and landfill facilities. Non-PAYT cities have publicly owned transfer stations more often than do PAYT cities. In PAYT cities the most common situation is:

- 32% no transfer station (vs. 31% non-PAYT)
- 32% private owned stations (22% non-PAYT)
- 23% public transfer station (35% non-PAYT)
- Another 9% have a publicly owned/private operated transfer station or 'other' (about the same figures for non-PAYT).

Disposal for PAYT communities is most often at a private landfill while the other cities split the garbage between private and public landfills. For PAYT cities:

- 71% go to a private landfill (40% non-PAYT)
- 19% go to a public landfill (40% non-PAYT)
- No large PAYT cities use public / private disposal partnerships (15% for non-PAYT)
- The remainder is roughly evenly split between 'other' and incinerators.

Both PAYT and non-PAYT communities pay about \$32 to dispose of trash, with a minimum of about \$15 and a maximum of \$98 / ton. We also asked about put-or-pay agreements, which can discourage diversion because the total disposal bill remains the same, even if the tonnage delivered decreases (or is diverted). This question resulted in some interesting answers. A significant number (50% of PAYT, and 29% of non-PAYT cities) of these 100 largest cities report having a put or pay agreement and are still trying to increase diversion.⁴⁹

We asked how trash collection was billed for non-PAYT communities. We found that the most common payment method is a fixed fee unlimited system and the least common method is a line item on the residents' tax statements.

- 36% fixed fee unlimited
- 34% taxes no line item

⁴⁹ Their tonnages may still exceed the put-or-pay floor requirements or there may be other fiscal or policy reasons for doing so, beyond direct disposal savings.

- 24% other
- 6% taxes line item

PAYT Program

Thirty percent of the largest 100 cities used PAYT systems. The longest running program is in Spokane, Washington which started in 1944,⁵⁰ preceding Minneapolis's system by 38 years. The two most popular years for implementation of PAYT programs in large cities were 1990 and 1991. Two cities implemented programs in 2004 (Stockton California and Kansas City Missouri). The median year in 1990 and the average year is 1991.

When asked about illegal dumping overall, a quarter of all cities said it was a high problem, and 30% said it was a medium problem. Among PAYT communities, a slightly higher proportion reported illegal dumping problems.

- 29% of PAYT communities said illegal dumping was a high problem (25% for non-PAYT)
- 38% medium problem (27% non-PAYT)
- 33% low problem (43% non-PAYT)
- 0 no problem (6% non-PAYT).

When the PAYT cities were asked to expand upon the illegal dumping problem and relate how they addressed or why it persists, some of the responses were:

- Easy access to transfer station, low fees, and transfer station open until 7pm in summer helped reduce dumping.
- It will last forever, little enforcement or staff dedicated to picking it up
- Voucher system helps. Haulers help with looking for it, getting paperwork in line, and reporting it.
- Work with code enforcement with fines, it has always been a problem.
- Attempt to identify dumper if possible, post signs, \$700 fine if caught.
- The mayor has been proactive, created a litter task force, does promotion, hires the homeless to pick up trash.
- Medium to low problem, only 10% of customers believe it is a problem.
- Multi-family buildings are a big problem.

Some of the responses for the non-PAYT cities included:

- Five years ago it was bad but now we have virtually unlimited collection.
- Been a problem as long as I can remember.
- Use code enforcement officers, hotlines, and cameras in high risk areas.
- Landfill is free on the weekends
- Inner city was a problem. Went from large barrels to individual carts but the tonnage increased. Put two police officers in charge of it and put fines in place, went from 3,500 requests last year to 300 this year.
- Residents from unincorporated areas tend to dump, not as much in the city.
- Contractor responds to reported dumping and has a monthly sweep, costs about \$50,000 a year.
- Hired 8-10 trash police and its helping. The biggest problem is getting people to identify dumpers.
- Virtually none because they provide "Cadillac" service (i.e. no limit to what can be picked up).

There were many more comments along the same lines for both groups.

The vast majority of the towns using PAYT have variable rates set up for different sized trash cans. About 90% use a variable can / subscribed can system, and the remainder is split between hybrid tag and hybrid can systems. For the hybrid systems, half use a base service level of 90 gallons, and the others use a base of 60 gallons before additional fees must be paid by residents.

⁵⁰ Not all the cities were able to provide starting years.

The size of the smallest available can varied from 9 to 95 gallons, with an average of 41 gallons. The most common smallest container was 20 gallons followed by 64 gallons.

- 28% use 20 gallons as the smallest container
- 20% use 64 gallons
- 12% use 30 gallons
- 8% use 95 gallons
- The remainder was split fairly evenly between smallest can sizes of 9, 12, 22, 32, 35, 40, 60 and 68 gallons.

For the second size the cans range from 20 gallons to 110 gallons with an average size of 61 gallons. The most common size is 32 gallons and the second most common is 64 gallons. Sixty percent of cities have a third size offered. The two most common sizes are 96 gallons and 64 gallons. Thirty percent of the cities offered a fourth size.

When asked about the cost of PAYT programs by can, we found:

- 1st service level - reporting with an average cost of \$12.67 and a range of \$1.00-\$24.25
- 2nd cans reporting with an average cost of \$15.95 and a range of \$3.86-\$26.75
- 3rd cans reporting with an average of \$22.73 and a range of \$7.28-\$54.10
- 4th cans reporting with an average of \$42.55 and a range of \$25.00-\$93.35

Case Studies 3.5.2

Fort Worth TX

Fort Worth Texas recently implemented their PAYT program for a variety of reasons, with environmental stewardship topping the list. Searching for a way to lower costs and under pressure from environmental groups to increase diversion, the City decided to transition from bi-weekly pick-up to a once-a-week PAYT program. Fort Worth has 618,000 residents with service to 170,000 households, making it one of the largest cities in the country with PAYT. The trash is collected by multiple haulers who are under contract to the City, using fully automated trucks. The program was implemented on April 1, 2003. The rates for residential pick up are as follows: 32-gallon cart/ \$11.45, 64-gallon cart/ \$16.45 and 96-gallon cart/ \$21.45. Residents can also purchase city authorized bags for garbage exceeding their limit at a price of \$3.00 per bag. If a customer leaves trash outside of their cart in unacceptable bags or containers, they are charged a \$10.00 administration fee and \$65.00 per 5 cubic yards of materials. This penalty, when combined with the different size containers, has proven to be a powerful incentive for residents to increase diversion.

Fort Worth is aiming for a 40% diversion rate and has made great strides to attain that rate since the implementation of their PAYT system. In 2005 they collected 261,300 tons of garbage, 55,000 tons of recycling and 16,000 tons of yard waste giving the city a diversion rate of 21%. This is up from less than 6% before they implemented PAYT, a huge increase in only two years. Kim Mote, from the Fort Worth Environmental Management Department, attributes this success to the PAYT program, the single stream curbside recycling program and yard waste collection.

In order for a city the size of Fort Worth to implement PAYT programs two elements were vital - the education of residents and political support for the program. Without either, according to Mr. Mote, the implementation process would have been much more difficult. To educate residents the city used direct mailers combined with community outreach and meetings to spread the word, "basically meeting with as many people as often as possible" to assuage their doubts about the change. Although the size of Fort Worth did not stop the program from achieving success, it did slow down the implementation. The large population made it difficult to spread information to the public about the switch to PAYT. The program is now in its third year and is just starting to operate the way the city intended. They still encounter residents who don't understand the PAYT program, as do communities of 10,000. It has just taken Fort Worth a little longer to get to this point compared to some of the smaller cities that sometimes report full implementation in months, not years.

As with many of the other case studies, a persistent problem is educating residents about the benefits of a PAYT system. Some residents still aren't "getting" the program and continue to place extra garbage outside of their prescribed limit. With continued efforts from the city this has been decreasing greatly over the past few months. To help answer questions and inform the public about the system, Fort Worth took the extra step of setting up an independent call center. Although the garbage is actually collected by haulers, the city set up a municipally run call center to answer questions. This helped reduce residents' concerns that the haulers were just trying to increase revenue with the new system. With the city answering the phones the residents felt they were getting a more straightforward answer and realized they could actually save money. Now, after three years, the overwhelming support by residents for the program and the large increases in diversion that have been accomplished demonstrate the success of PAYT in Texas.

Sacramento CA

Sacramento is the oldest city in the state of California and is the fourth largest in the state using a PAYT program. The city has been using PAYT for over ten years and is seeing extremely high diversion rates on their way toward a goal of becoming a "zero waste" city. They immediately saw an increase from 12 tons of recyclables per day collected to 36 tons when they switched to PAYT. The city now collects over 300 tons per day of recyclables.

Garbage in Sacramento is collected by the municipality and they set the rates for pick-up. The city also picks up recycling and yard waste. Sacramento uses a variable can system with the following rates going into effect in 2007: one 32-gal cart is \$10.15 and an additional cart is \$9.00, one 64-gallon cart is \$12.35 and an additional cart is \$10.50, and one 96-gallon cart is \$14.95 with an additional cart charge of \$12.00. An extra bag on a normal route for the 32 gallon service is \$5.25, for the 64-gallon service it is \$6.30, and for the 96-gallon service it is \$8.35. When compared to their recycling fee of \$3.50 for a 96-gallon commingled container, the economic incentive for diversion becomes significant.

Sacramento's program both encourages recycling and lowers the amount of waste disposed of in the city. In 2005 they collected 129,500 tons of garbage and 36,700 tons of recycling. They also collected 88,100 tons of yard waste which puts them at a 50% diversion rate. The city switched to single stream recycling in 2001-2002 which also led to huge increases in their recycling rate. When asked what helped most to increase recycling in the community, Marty Strauss, the city's Integrated Waste Management Superintendent, said "outreach and education". The residents have realized advantages not just "green" benefits, but economic ones as well. When asked what works best about the system, Mr. Strauss said first and foremost the diversion, followed by the fact that "if people aren't filling their cans than they can get a smaller one--and pay less of a fee." The cities strong outreach programs coupled with the economic incentives inherent to PAYT, have led to the high rate of diversion in the city.

For the most part, the large size of the city has not proven to be a deterrent for implementing PAYT. However, the current rapid growth of the city is starting to affect the trash and recycling collection routes of the haulers. Drivers with daily routes of 900 households are now responsible for 1,200-1,300 homes per day. The city is working hard to alleviate this problem.

Overall, the resident's of Sacramento like their PAYT system. Even with its success, however, the city is constantly striving to improve diversion. They recently switched from bi-weekly recycling pick-up to once-a-week and they report it has reduced contamination in the recycling stream. They are also planning to take the City's voluntary green (food waste) bin program city-wide. Mr. Strauss, like many of the other proponents of PAYT, feels that combating ignorance about PAYT is the largest problem for a community to overcome. His advice is: "Take your time in implementation and make sure to bring the public

PAYT Large Cities Case Studies	
Fort Worth TX	<i>Population- 618,000 Implemented in 2003 Increased diversion from 6% to over 21%</i>
Sacramento CA	<i>Population-445,287 Has been in use for over a decade and they are still evolving the program Collect 300+ tons of recycling daily 50% diversion</i>
Minneapolis MN	<i>Population-375,000 Began in 1989 Two can sizes and a \$7 rebate offered for recycle set out 33% diversion rate</i>
Oakland, CA	<i>Population-400,000 Longstanding program 20-gallon mini-can and aggressive rate incentives in place Success in reaching 50% goal; working toward 75% by 2010</i>
City X	<i>Population-200,000 Program difficulties including high percentages of residents on large cans, attributed to weak education program for PAYT Behind in progress toward diversion goal</i>

along... communication is critical!" Sacramento, like the majority of the other case study cities, has seen the importance of educating the residents about PAYT systems so they can embrace it and affect diversion rates in a positive and meaningful way.

Minneapolis, Minnesota

Minneapolis began curbside recycling in 1982 and started their version of PAYT in 1989. Minneapolis uses a unique system for setting their rates. There are only two sizes to choose from, a 22-gallon and a 96-gallon container. Residents are charged a flat fee of \$22.25 a month and if they use the small cart it adds \$2.00 to the monthly bill while the large cart adds \$4.00 to the bill. The difference in the system comes into play with recycling. If the resident sets out recycling, they *subtract* \$7.00 from the bill.⁵¹ More than 90% of the 75,000 households in the city set out recycling. This pricing system, although providing some incentive to decrease garbage, is mostly designed to increase recycling. Minneapolis recycles 21,200 tons of material, 20,700 tons of yard waste, and collects 112,700 tons of garbage. Their overall diversion rate for 2005 was 33%.

Unlike other cities that are looking into single stream collection coupled with PAYT to maximize diversion, Minneapolis is happy with their current recycling system which collects ten separate streams. The residents must separate into ten categories and the collection truck has ten bins. Judy Brown, of the Minneapolis Solid Waste Department, says this is key for the program revenue. "We don't recommend single stream to anyone. The required sorting of our program insures good, clean, uncontaminated recycling that we can earn money on." If a customer is tagged as being a "bad" recycler, i.e., not cleaning glass or separating materials, the city takes away their \$7.00 discount.

Oakland CA

Oakland has been using a PAYT system for many years, and as a consequence, issues involved with implementation have been largely forgotten. The City's 400,000 residents are all so accustomed to the pay-as-you-throw mentality that the outreach and education programs that are integral in the other cities here do not need to emphasize the PAYT aspects of the City's programs. Garbage is collected by only one hauling company, which has a franchise with the city. The trucks used are both fully and semi-automated. The system is variable rate and cans, and there are four sizes for residents to choose from. The sizes and rates are: 20-gallons cost \$18.50/month, 35-gallons cost \$24.82, 64-gallons cost \$54.10 and 96-gallons cost \$93.35. Single-stream recycling costs are embedded within those prices and collected by the same hauler. Although exact diversion data were not available for the city, their reported diversion rate is currently over 50% and they are aiming for a goal of 75% diversion by 2010.

Becky Dowdkin, from the City of Oakland, states she did have some input into the PAYT program in Oakland although she was not present for the system implementation. "Overall", she said "it is a straightforward variable rate system and was not difficult to implement." It was also made a little easier by the fact that there is only one hauler serving the city. When PAYT first began in Oakland, the largest challenge for the city was setting the rates. It was important that the rates were made equitable for both the hauler and city. The key was to set prices that would motivate diversion by residents and not end up as an automatic loss of revenue for the hauler. After working together, the city and the hauler were able to set rates with an automatic yearly increase. These were at a level that all parties could agree to.

Now, after the system has been in place for so long, the haulers are happy with the rates, the city is happy with the diversion, and the residents support the system. Unlike some of the other case studies that are relatively new, the residents in Oakland have grown to view garbage collection like a utility. The rates are set that allow customers to control their costs, and just like water or electricity, the more they use the more they pay. Ms. Dowdkin said "Residents like it; they definitely make a connection between the rates, recycling, and reduction." When asked what advice she had for others communities planning to implement PAYT, she replied, "Overall it's a pretty simple system to implement. The catch is what agreement the town has with the

⁵¹ Other cities have offered rebates for recycling in the past; one (now discontinued) program even varied the rebate with the overall level of recyclables collected from the residential sector.

haulers. It is important that there is some equity for both the haulers and the city's interest." Oakland exemplifies this cooperation and like Fort Collins Colorado, shows that increased diversion does not result in decreased revenue.

City X⁵²

One city of 200,000 on the west coast has seen that without proper outreach and education for the public, PAYT will not truly be successful. The city offers two sizes of automated collection carts, 100-gallon and 64-gallon with prices of \$19.18 and \$9.21 respectively. This seems like a good economic incentive for waste reduction but the problem occurred during implementation. When the PAYT program was rolled out, according to a senior waste planner in the city, the city "did not aggressively promote the smaller containers". With the relatively low rates for the 100-gallon containers compared to other cities in the area, virtually no one in the city chose the smaller 64-gallon option. "We did not advertise the smaller containers so everyone got the same size" said the planner.

They are working to push the smaller container, however with most of the residents already signed up for the larger size it is proving to be difficult. This illustrates what can happen if there is a schism between the environmental agenda and the political agenda in the city. Now that much of the municipally collected trash is being collected at the higher rate, there is little political support to have residents switch to the smaller containers. While this would increase diversion and decrease bills for residents, some city officials like the increased revenue from the larger containers. The overall diversion rate in this city is still relatively high, but if the PAYT program was implemented with more emphasize on outreach and education, they could now possibly be at their 2002 goal of 50%.

3.6 Summary

The results of this study demonstrate the versatility of PAYT. Recycling coordinators, city councils, haulers, and planners can all work together to sculpt a plan that best fits the community. Individualized plans can be adapted to meet various goals, resolve issues that may be encountered, keep residents happy, and in the end, create large gains in recycling and waste diversion for the community.

PAYT programs have been successful in increasing diversion and reducing household garbage disposal – as demonstrated in almost 7,100 communities in the US. These flexible systems work in large and small communities, with any type of collection system. Billing can be very straightforward, and if sufficient political will is behind the change, PAYT systems are very quick to implement. Problems that arise with these systems are rarely technical but can be political; however, surveys show once in place, more than 95% of households do not want to go back to the older systems that create inequity in costs and benefits.⁵³ While perhaps not suited to every single community in the US, the vast majority of communities would benefit from examining PAYT as the most effective way to augment their recycling and source reduction programs.

⁵² The name of this city is withheld because the lesson, not the name of the city, is most important.

⁵³ Skumatz, Lisa A., Ph.D., "Variable Rates for Municipal Solid Waste: Implementation Experience, Economics, and Legislation", prepared for Reason Foundation by Skumatz Economic Research Associates, Inc., Los Angeles, CA, Policy Study 160, June 1993.