# Biomass Resource Assessment Part II: Availability and Cost Analysis of Using Municipal Solid Waste Components as Alternative Fuel Sources for Power Generation

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# 1. INTRODUCTION

## 1.1. Project Background and Scope

Over the centuries, people have found ways to harness energy, such as using animals to do work or inventing machines to tap the power of wind or water. The industrialization of the modern world was accompanied by the widespread and growing use of fossil fuels such as coal, oil, and natural gas. In recent years, the emphasis has been on exploring the use of potential fuel sources from other items available in the environment (either natural or man made) and use it as an energy source. This debate has very recently gained momentum with the widespread talk of global warming and its impact on weather conditions. Fossil fuels are a major source of pollutants responsible for global warming as green house gases. One of the potential areas which have been discussed recently in the energy industry is the use of certain waste components from municipal solid waste (MSW) and construction and demolition debris (C&D), especially the ones with high calorific value as a fuel for power plants.

Gainesville Regional Utilities (GRU) contracted Prof Douglas Carter of the School of Forest Resources and Conservation at University of Florida to explore the use of alternative sources of fuel other than coal. The research project had two components, one exploring the use of woody biomass and the other exploring the potential fuel components from waste collected and managed by municipalities and counties. This document is focused on the work carried out for the second part of this project by Dr. Tim Townsend's research group at Department of Environmental Engineering Sciences, University of Florida. The project scope include the identification, availability, sustainability and economic feasibility of using the potential fuel from waste components of MSW and C&D streams in power plants as either a full or partial replacement of fossil fuel such as coal. Waste components from MSW and C&D were identified for their potential to be used as a fuel source for energy production. Examples from these waste streams includes: wood waste from C&D debris, refuse derived fuel from MSW, and other potential wastes (e.g., tires). The focus of this report is on the waste streams that are collected by the municipalities and counties.

## 1.2. Tasks

To accomplish the goal of the project, the research activities were divided into several tasks as presented in detail below. Activities for different tasks were carried out for several counties in

Florida, Georgia and Alabama. A maximum travel time of two hours from the three existing power plant facilities, Gainesville Deerhaven Facility, Jacksonville Brandy Branch Facility and Tallahassee Hopkins Facility, defined the geographic scope used to identify counties included in the study.

Task 1: The feasibility of using all these waste components as identified above was evaluated. A thorough detailed literature review was conducted to identify fuel sources and learn what has been done so far by others on this topic. The potential lessons that can be used in the context of local conditions specific to this project are identified.

Task 2: The amount and sources of these potential fuels as waste components were ascertained. The long term supply potential of these waste resources was evaluated.

Task 3: A cost analysis of alternative fuel sources in a ready to use form for GRU for the individual components was conducted. This includes transportation costs and any processing costs involved to make it usable.

Task 4: Potential environmental issues were evaluated, including contamination issues of waste components (e.g., contamination of C&D debris wood waste streams from wood preservative).

### 1.3. Organization of the Report

This report is organized in nine different chapters. Chapter 1 presents the introduction and background to this study. Chapter 2 presents the details of the methodology used for different tasks completed as a part of this study. Evaluation of potential waste fuel sources is summarized in Chapter 3. The subsequent Chapters (Chapters 4 through 7) present fuel descriptions, current management, waste projection and feasibility assessments for various potential waste components such as C&D debris wood waste, municipal solid waste, yard trash and tires. Chapter 8 provides a brief summary of the study and Chapter 9 lists the references cited in this report and additional pertinent reading material.

# 2. METHODOLOGY

## 2.1. Fuel Source Analysis

A detailed literature review was carried out to indentify the different waste components that have been used as a fuel source in different parts of the world. Literature review included journal articles (accessed through University of Florida library system) and various reports published on web by waste and energy industry and environmental organizations working in this area. Out of the various components identified from the literature, possible items that would be potential candidate as a fuel source for the geographical region of this project were identified and studied in detail. In addition to the literature survey, local professionals from the waste and energy industry were contacted and information was gathered from using telephone interviews regarding potential fuel candidates in this region.

## 2.2. Project Boundaries

The study was conducted focusing on the counties within a maximum travel distance of two hours from the three existing power plant facilities that are being targeted in this study. The plants include the Deerhaven Facility at Gainesville, the Brandy Branch Facility at Jacksonville, and the Hopkins Facility at Tallahassee (Figure 2-1). The locations of major solid waste management facilities in these regions have been identified and the distance from these facilities to the plant location has been used for calculating transportation costs. Table 2-1 presents the population, major cities, and the facility region for the various counties included in this study.

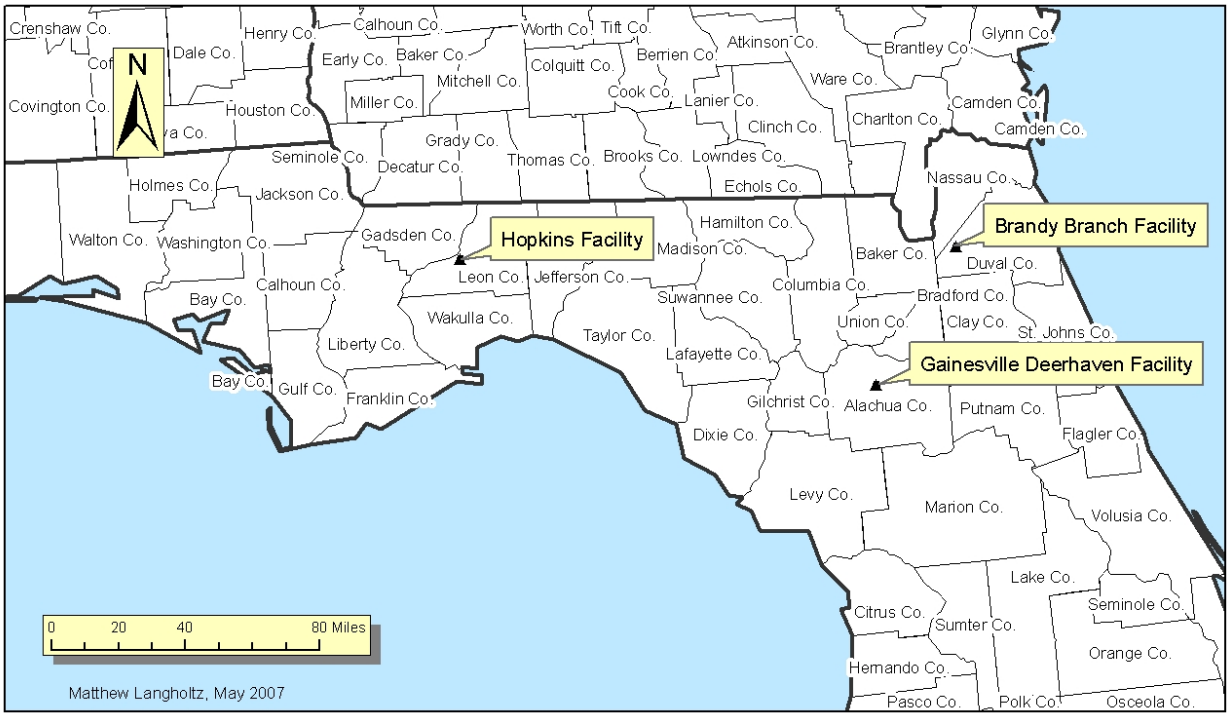


Figure 2-1. Location of power plant facilities and counties within the study region.

Table 2-1. List of counties included in the study with additional background data.

| Name | State | Population (2007) | Major cities in the County |
|---|---|---|---|
| Alachua | Florida | 249,223 | Alachua, Archer, Gainesville, Hawthorne, High Springs, LaCrosse, Micanopy, Newberry, Waldo |
| Baker | Florida | 24,415 | Macclenny, Glen St. Mary, Sanderson, Taylor, Olustee, Baxter, Cuyler, Margarette, Manning |
| Bay | Florida | 167,644 | Callaway, Cedar Grove, Lynn Haven, Mexico Beach, Panama City, Panama City Beach, Parker, Springfield |
| Bradford | Florida | 28,806 | Brooker, Hampton, Lawty, Starke |
| Calhoun | Florida | 14,412 | Altha, Blountstown |
| Citrus | Florida | 139,000 | Crystal River, Inverness |
| Clay | Florida | 181,346 | Green Cove Springs, Keystone Heights, Orange Park, Penney Farms |
| Columbia | Florida | 64,045 | Fort White, Lake City |
| Dixie | Florida | 16,113 | Cross City, Horseshoe Beach, Old Town |
| Duval | Florida | 837,964 | Atlantic Beach, Jacksonville, Baldwin, Jacksonville Beach, Neptune Beach |
| Flagler | Florida | 91,617 | Beverly Beach, Bunnell, Flagler Beach, Marineland, Palm Coast |
| Franklin | Florida | 11,577 | Apalachicola, Carrabelle |
| Gadsden | Florida | 48,971 | Chattahoochee, Greensboro, Gretna, Havana, Midway, Quincy |
| Gilchrist | Florida | 17,059 | Bell, Fanning Springs, Trenton |
| Gulf | Florida | 16,936 | Port St. Joe, Wewahitchka |
| Hamilton | Florida | 14,491 | Jasper, Jennings, White Springs |
| Hernando | Florida | 159,771 | Brooksville, Weeki Wachee |
| Holmes | Florida | 19,461 | Bonifay, Esto, Noma, Ponce de Leon, Westville |
| Jackson | Florida | 51,233 | Cottondale, Graceville, Jacob, Malone, Marianna, Alford, Bascom, Campbellton, Grand Ridge, Greenwood, Sneads |
| Jefferson | Florida | 14,549 | Monticello |
| Lafayette | Florida | 8,409 | Mayo |

| Name | State | Population (2007) | Major cities in the County |
|---|---|---|---|
| Lake | Florida | 283,992 | Astatula, Clermont, Eustis, Fruitland Park, Groveland, Howey-In-The-Hills, Lady Lake, Leesburg, Mascotte, Minneola, Montverde, Mount Dora, Tavares, Umatilla |
| Leon | Florida | 282,826 | Tallahassee |
| Levy | Florida | 39,484 | Bronson, Cedar Key, Chiefland, Fanning Springs, Inglis, Otter Creek, Williston, Yankeetown |
| Liberty | Florida | 7,849 | Bristol |
| Madison | Florida | 20,081 | Madison, Greenville, Lee |
| Marion | Florida | 325,188 | Ocala, Belleview, Dunnellon, McIntosh, Reddick |
| Nassau | Florida | 68,647 | Callahan, Fernandina Beach, Hilliard, Yulee |
| Orange | Florida | 1,104,543 | Apopka, Belle Isle, Eatonville, Edgewood, Maitland, Oakland, Ocoee, Orlando, Windermere, Winter Garden, Winter Park, Bay Lake, lake Buena Vista |
| Pasco | Florida | 433,896 | Dade City, New Port Richey, Port Richey, San Antonio, St. Leo, Zephyrhills |
| Putnam | Florida | 74,981 | Crescent City, Interlachen, Palatka, Pomona Park, Welaka |
| St. Johns | Florida | 171,666 | Hastings, Marineland, St. Augustine, St. Augustine Beach |
| Sumter | Florida | 84,264 | Bushnell, Center Hill, Coleman, Webster, Wildwood |
| Suwannee | Florida | 39,560 | Branford, Live Oak |
| Taylor | Florida | 19,842 | Perry |
| Union | Florida | 15,693 | Lake Butler, Raiford, Worthington Springs |
| Volusia | Florida | 515,177 | Daytona Beach Shores, Daytona Beach, DeBary, DeLand, Deltona, Edgewater, Holly Hill, Lake Helen, New Smyrna Beach, Oak Hill, Orange City, Ormond Beach, Pierson, Ponce Inlet, Port Orange, South Daytona |
| Wakulla | Florida | 29,566 | Sopchoppy, St. Marks |
| Walton | Florida | 52,270 | De Funiak Springs, Freeport, Paxton |
| Washington | Florida | 24,514 | Chipley, Caryville, Ebro, Sunny Hills Vernon, Wausau |

| Name | State | Population (2007) | Major cities in the County |
|---|---|---|---|
| Baker | Georgia | 4,074 | Newton |
| Brantley | Georgia | 14,629 | Hoboken and Nahunta |
| Brooks | Georgia | 16,450 | Morven and Quitman |
| Calhoun | Georgia | 6,320 | Arlington, Edison, Leary and Morgan |
| Camden | Georgia | 43,664 | Kingsland, St. Marys and Woodbine |
| Charlton | Georgia | 10,282 | Folkston and Homeland |
| Clinch | Georgia | 6,878 | Argyle, Dupont, Fargo and Homerville |
| Colquitt | Georgia | 42,053 | Berlin, Doerun, Ellenton, Funston, Moultrie, Norman Park and Riverside |
| Cook | Georgia | 15,771 | Adel, Cecil, Lenox and Sparks |
| Decatur | Georgia | 28,240 | Attapulgus, Bainbridge, Brinson and Climax |
| Dougherty | Georgia | 96,065 | Albany |
| Early | Georgia | 12,354 | Blakely, Damascus and Jakin |
| Echols | Georgia | 3,754 | Statenville |
| Glynn | Georgia | 67,568 | Brunswick |
| Grady | Georgia | 23,659 | Cairo and Whigham |
| Lanier | Georgia | 7,241 | Lakeland |
| Lowndes | Georgia | 92,115 | Dasher, Hahira, Lake Park, Remerton and Valdosta |
| McIntosh | Georgia | 10,847 | Darien |
| Miller | Georgia | 6,383 | Colquitt |
| Mitchell | Georgia | 23,932 | Baconton, Camilla, Pelham and Sale City |
| Pierce | Georgia | 15,636 | Blackshear, Patterson |
| Seminole | Georgia | 9,369 | Donalsonville and Iron City |
| Thomas | Georgia | 42,737 | Barwick, Boston, Coolidge, Meigs, Ochlocknee, Pavo and Thomasville |

| Name | State | Population (2007) | Major cities in the County |
|---|---|---|---|
| Ware | Georgia | 35,483 | Waycross |
| Wayne | Georgia | 26,565 | Jesup, Odum, Screven |
| Worth | Georgia | 21,967 | Sylvester, Poulan, Sumner, Warwick, Oakfield, Doles, Anderson City, Bridgeboro, Isabella, Shingler, Scooterville |
| Geneva | Alabama | 25,764 | Black, Coffee Springs, Eunola, Geneva, Hartford, Malvern, Samson, Slocomb |
| Henry | Alabama | 16,310 | Abbeville, Haleburg, Dothan, Headland, Newville |
| Houston | Alabama | 88,787 | Ashford, Avon, Columbia, Cottonwood, Cowarts, Dothan, Gordon, Kinsey, Madrid, Rehobeth, Taylor, Webb |

## 2.3. Regional Waste Assessment

An assessment of waste types was carried out for each county. In this report data for each county is presented separately.

### 2.3.1. Sources

The different waste components from the MSW and C&D debris waste streams were identified from waste composition charts. Different waste professionals were also contacted to identify region/county specific potential waste streams which could be used as a fuel source.

### 2.3.2. Generation

To assess how much of a fuel source (as a waste item) is being generated in the region; the available data from previous studies (e.g., Annual Solid Waste Reports published by Department of Environmental Protection) were used. The steps involved in collecting data related to waste generation rates, waste composition and population for each county included in the study.

### 2.3.3. Projections

Future waste production projections were made for the next 5 years (2007 to 2012). This was accomplished by collecting projected population data from US Census Bureau statistics for the counties included in the study region. Waste generation rates and waste composition were assumed to be constant during this duration. A spreadsheet was developed for calculating waste components for different years. The detail for each waste component is presented in the relevant section later in this document.

## 2.4. Economic Evaluation

A cost assessment for each fuel source in a region was carried out. Important cost components were evaluated for each item. These include the tipping fee for the waste components in the region, the cost of transportation from the source of waste collection for that county to the power plant site and the processing costs required to make the waste usable as a fuel. Incorporating the energy potential value (Btu/lb) of the waste component, the cost of each item in the county was calculated in $/MMBtu (million Btu). For transportation costs, the distance between the three power plants and the solid waste collection point in the county was calculated (Table 2-2). The time required for transport from the waste collection facility to a power plant using least time routes was ascertained using the website www.mapquest.com.

(Table 2-3). The solid waste collection point for a county is either the transfer station in the county, or the active landfill site. In some cases, it is the active solid waste facility outside of the county where the waste is taken directly (ea. Landfill or waste to energy (WTE) facility) rather than first going to an in county facility (e.g. transfer station). It is assumed here that all the wastes produced in the county are being collected at that particular specific location. For calculating the cost of waste processing, the average values gathered from telephone interviews with waste professionals throughout the region was used (Table 2-4). For the cost calculations, only the expenses to be made in terms of processing the waste components and the transportation cost has been included. The possible income from the tipping fee is not taken into consideration. To assess the transportation cost of the waste components, mode of transportation was assumed to be truck loads with a unit cost of $.11 per ton-mile (this value was used by the Black and Veach study of October 2006). The cost results for individual components are presented in subsequent chapters.

Table 2-2. Distance (in miles) to the three power plant facilities from county waste collection centers.

| County | State | GRU Deerhaven | JEA Brandy Branch | TAL Hopkins |
|---|---|---|---|---|
| Alachua | Florida | 9 | 54 | 159 |
| Baker | Florida | 55 | 23 | 135 |
| Bay | Florida | 266 | 272 | 126 |
| Bradford | Florida | 37 | 32 | 164 |
| Calhoun | Florida | 149 | 154 | 4 |
| Citrus | Florida | 79 | 122 | 221 |
| Clay | Florida | 60 | 44 | 192 |
| Columbia | Florida | 51 | 48 | 112 |
| Dixie | Florida | 44 | 109 | 114 |
| Duval | Florida | 63 | 8 | 157 |
| Flagler | Florida | 81 | 87 | 239 |
| Franklin | Florida | 208 | 214 | 72 |
| Gadsden | Florida | 167 | 171 | 24 |
| Gilchrist | Florida | 35 | 100 | 151 |
| Gulf | Florida | 243 | 249 | 97 |
| Hamilton | Florida | 67 | 73 | 106 |
| Hernando | Florida | 109 | 152 | 187 |
| Holmes | Florida | 234 | 239 | 91 |
| Jackson | Florida | 225 | 232 | 86 |
| Jefferson | Florida | 105 | 110 | 53 |
| Lafayette | Florida | 60 | 96 | 102 |
| Lake | Florida | 99 | 142 | 241 |
| Leon | Florida | 135 | 141 | 11 |
| Levy | Florida | 48 | 93 | 137 |
| Liberty | Florida | 185 | 190 | 33 |
| Madison | Florida | 105 | 110 | 53 |
| Marion | Florida | 58 | 92 | 200 |
| Nassau | Florida | 79 | 25 | 178 |
| Orange | Florida | 137 | 167 | 279 |
| Pasco | Florida | 139 | 182 | 281 |
| Putnam | Florida | 56 | 67 | 206 |
| St. Johns | Florida | 85 | 65 | 213 |
| Sumter | Florida | 80 | 123 | 222 |
| Suwannee | Florida | 66 | 71 | 97 |
| Taylor | Florida | 93 | 135 | 71 |
| Union | Florida | 47 | 28 | 153 |
| Volusia | Florida | 111 | 112 | 260 |
| Wakulla | Florida | 164 | 170 | 24 |

| County | State | GRU Deerhaven | JEA Brandy Branch | TAL Hopkins |
|---|---|---|---|---|
| Walton | Florida | 267 | 272 | 124 |
| Washington | Florida | 229 | 234 | 86 |
| Baker | Georgia | 185 | 190 | 75 |
| Brantley | Georgia | 119 | 71 | 215 |
| Brooks | Georgia | 116 | 120 | 67 |
| Calhoun | Georgia | 214 | 220 | 92 |
| Camden | Georgia | 116 | 60 | 214 |
| Charlton | Georgia | 97 | 50 | 192 |
| Clinch | Georgia | 135 | 88 | 121 |
| Colquitt | Georgia | 141 | 147 | 66 |
| Cook | Georgia | 121 | 127 | 83 |
| Decatur | Georgia | 185 | 190 | 42 |
| Dougherty | Georgia | 178 | 185 | 92 |
| Early | Georgia | 224 | 229 | 81 |
| Echols | Georgia | 90 | 78 | 114 |
| Glynn | Georgia | 145 | 91 | 239 |
| Grady | Georgia | 170 | 177 | 32 |
| Lanier | Georgia | 99 | 104 | 85 |
| Lowndes | Georgia | 100 | 106 | 79 |
| McIntosh | Georgia | 164 | 108 | 263 |
| Miller | Georgia | 203 | 209 | 67 |
| Mitchell | Georgia | 164 | 171 | 63 |
| Pierce | Georgia | 147 | 92 | 155 |
| Seminole | Georgia | 203 | 209 | 67 |
| Thomas | Georgia | 138 | 144 | 41 |
| Ware | Georgia | 97 | 50 | 192 |
| Wayne | Georgia | 142 | 93 | 186 |
| Worth | Georgia | 141 | 147 | 65 |
| Henry | Alabama | 273 | 254 | 112 |
| Houston | Alabama | 203 | 209 | 71 |
| Geneva | Alabama | 254 | 261 | 110 |

Table 2-3. Travel time (in minutes) to the three power plant facilities from county waste collection centers.

| County | State | GRU Deerhaven | JEA Brandy Branch | TAL Hopkins |
|---|---|---|---|---|
| Alachua | Florida | 18 | 69 | 154 |
| Baker | Florida | 67 | 23 | 122 |
| Bay | Florida | 266 | 272 | 147 |
| Bradford | Florida | 51 | 36 | 161 |
| Calhoun | Florida | 174 | 167 | 9 |
| Citrus | Florida | 95 | 150 | 218 |
| Clay | Florida | 78 | 50 | 181 |
| Columbia | Florida | 52 | 50 | 108 |
| Dixie | Florida | 52 | 127 | 118 |
| Duval | Florida | 76 | 8 | 140 |
| Flagler | Florida | 123 | 96 | 230 |
| Franklin | Florida | 222 | 228 | 99 |
| Gadsden | Florida | 152 | 155 | 31 |
| Gilchrist | Florida | 49 | 100 | 148 |
| Gulf | Florida | 255 | 261 | 136 |
| Hamilton | Florida | 68 | 76 | 110 |
| Hernando | Florida | 119 | 175 | 231 |
| Holmes | Florida | 208 | 210 | 66 |
| Jackson | Florida | 209 | 215 | 90 |
| Jefferson | Florida | 95 | 98 | 52 |
| Lafayette | Florida | 83 | 105 | 111 |
| Lake | Florida | 99 | 165 | 233 |
| Leon | Florida | 129 | 135 | 23 |
| Levy | Florida | 69 | 128 | 170 |
| Liberty | Florida | 173 | 176 | 46 |
| Madison | Florida | 95 | 98 | 52 |
| Marion | Florida | 68 | 117 | 192 |
| Nassau | Florida | 103 | 33 | 155 |
| Orange | Florida | 134 | 161 | 257 |
| Pasco | Florida | 145 | 200 | 268 |
| Putnam | Florida | 72 | 85 | 204 |
| St. Johns | Florida | 112 | 67 | 198 |
| Sumter | Florida | 79 | 134 | 202 |
| Suwannee | Florida | 63 | 66 | 91 |
| Taylor | Florida | 105 | 134 | 73 |
| Union | Florida | 62 | 34 | 145 |
| Volusia | Florida | 120 | 101 | 232 |
| Wakulla | Florida | 160 | 182 | 33 |

| County | State | GRU Deerhaven | JEA Brandy Branch | TAL Hopkins |
|---|---|---|---|---|
| Walton | Florida | 240 | 240 | 117 |
| Washington | Florida | 205 | 207 | 83 |
| Baker | Georgia | 187 | 190 | 97 |
| Brantley | Georgia | 163 | 94 | 231 |
| Brooks | Georgia | 109 | 112 | 83 |
| Calhoun | Georgia | 228 | 234 | 130 |
| Camden | Georgia | 135 | 70 | 208 |
| Charlton | Georgia | 131 | 69 | 200 |
| Clinch | Georgia | 133 | 113 | 142 |
| Colquitt | Georgia | 150 | 155 | 90 |
| Cook | Georgia | 112 | 118 | 119 |
| Decatur | Georgia | 174 | 177 | 52 |
| Dougherty | Georgia | 178 | 185 | 133 |
| Early | Georgia | 227 | 229 | 95 |
| Echols | Georgia | 100 | 93 | 130 |
| Glynn | Georgia | 153 | 86 | 217 |
| Grady | Georgia | 172 | 178 | 55 |
| Lanier | Georgia | 91 | 94 | 101 |
| Lowndes | Georgia | 96 | 102 | 101 |
| McIntosh | Georgia | 175 | 109 | 247 |
| Miller | Georgia | 212 | 218 | 96 |
| Mitchell | Georgia | 173 | 180 | 94 |
| Pierce | Georgia | 174 | 107 | 189 |
| Seminole | Georgia | 212 | 218 | 96 |
| Thomas | Georgia | 140 | 147 | 55 |
| Ware | Georgia | 131 | 69 | 199 |
| Wayne | Georgia | 191 | 121 | 241 |
| Worth | Georgia | 150 | 155 | 90 |
| Henry | Alabama | 270 | 265 | 115 |
| Houston | Alabama | 212 | 218 | 96 |
| Geneva | Alabama | 230 | 240 | 90 |

Table 2-4. Average tipping fee and waste processing cost for waste components.

| Item | Tipping fee ($/ton) | Processing cost ($/ton) |
|---|---|---|
| MSW | 50-60 | 40 |
| C&D | 20-30 | 20 |
| Yard trash | 15-20 | 20 |
| Tires | $1 per passenger car | 50 |
| | $3 per truck tire | 50 |

## 2.5. Feasibility Analysis

The feasibility of a particular fuel source was ascertained for the different regions identified for the facilities. It was done by assessing the availability of the source, the amount available, future availability, and cost. Any other potential site and item specific constraints were also taken into account in the feasibility analysis for that fuel source.

# 3. EVALUATION OF POTENTIAL WASTE FUEL SOURCES

## 3.1. Summary of Results

As described in the previous chapter, a literature review was conducted to evaluate the different potential fuel sources in the waste components. The literature review included journal articles, industry reports and relevant study reports of environmental organizations. Table 3.1 presents a summary of heat values (in Btu/lb) for the different waste components reported in these studies. The heat value was converted to the unit of Btu/lb for several studies as the value was available in different units (mostly in SI units). The potential waste fuel sources include the dry plant matter (yard waste), waste wood, municipal solid waste as mass burn and also as a refuse derived fuel. Some studies also report the incineration of MSW components after segregation. Other fuels reported in the literature include tires among others.

Table 3-1. Summary of results from the literature review: heat value in Btu/lb for relevant waste components.

| Study | Dry Plant Matter | Wood | MSW (mass burn) | Paper | Plastic | Tires | RDF |
|---|---|---|---|---|---|---|---|
| Demirbas (2001) | 4,200 | | | | | | |
| Chaya and Gheewala (2007) | | | 2,225-2,638 | | | | |
| Schmidt et al. (2006) | | | | 5,430 | | | |
| Giugliano et al. (2007) | | 7,043 | | 5,016 | 9,835 | | |
| Koop and Dichtl (2001) (as referenced in Lee and Tay 2004) | | | | | | | |
| Fobil et al. (2005) | | | 6,034-8,620 | | | | |
| Murphy and Power (2007) | | | | 7,650-7,750 | | | |
| Consonni et al. (2005) | | 5,980 | | 5,700 | 11,280 | | |
| Sharma et al. (1998) | | | | | | 13,500-14,400 | |
| Corti and Lombardi (2004) | | | 4,700 | | | | |
| Wolskey and Gaines (1981) | | | | | | 15,000 | |
| Jang et al. (1998) | | | | | | 12,000-16,000 | |

| Study | Dry Plant Matter | Wood | MSW (mass burn) | Paper | Plastic | Tires | RDF |
|---|---|---|---|---|---|---|---|
| Di Maria and Pavesi (2006) | | | | | | | 6,766-7,522 |
| Reddy et al. (2005) | | | | 5,271-6,237 | 10,788-11,926 | | |
| Sufian and Bala (2006) | | | 2,590 | | | | |
| Kaylen (2005) | | | 4,500-5,000 | 6500 | 15,000 | 14,000 | |
| Igoni et al. (2007) | | | 3,125 | | | | |
| Kiser and Burton (1992) | 4,200-7,000 | 4,700-7,000 | 5,000-5,200 | 7,200-8,000 | 9,500-18,000 | | 5,700-6,200 |

### 3.2. C&D Debris Wood Waste

Wood has been used as a fuel source since the beginning of human civilization in different forms. Wood waste included in the present study is the component available in the C&D debris waste stream. The majority of wood waste disposed of in the southeast US is made up of C&D debris. These wastes are produced as scrap from construction activities and results from the demolition of existing structures. It also includes, as a prominent component, disaster debris as a result of, for example, a hurricane or other natural disaster. Most of these wood wastes are disposed of through C&D debris recycling facilities or put in an unlined C&D debris landfill. In the C&D debris recycling facility the wood waste is either converted to mulch or chipped to be used as a boiler fuel.

### 3.3. MSW (Mass Burn and Refuse Derived Fuel)

MSW is usually burned as it is after some preliminary steps (mass burn). However, at some plants refuse derived fuel (RDF) is used. RDF is a fuel produced by shredding MSW or steam pressure treating in an autoclave. RDF consists largely of organic components of municipal waste such as plastics and biodegradable waste (paper, food waste, textiles. etc). RDF processing facilities are normally located near a source of MSW. RDF can be produced and used for energy production from the day to day waste components disposed of from domestic and industrial areas. RDF is produced essentially to facilitate the burning of the waste.

### 3.4. Tires

Tires can be used as a fuel alternative. Combustion facilities currently using tires as fuel include: (1) power plants; (2) tire manufacturing plants; (3) cement kilns; (4) pulp and paper plants; and (5) small package steam generators. In order to prevent discarded automobile tires from damaging the environment, it is highly desirable to recycle this material. However, the total mass quantity of tires currently recycled in a given year (not including reuse, retreading, or combustion) is less than 7% of the annual tire production rate. The number of tires produced each year will continue to far exceed the demand for scrap and used tires. Only a small portion of waste tires are retreaded, and a very small portion is devulcanized by tedious processes. Tires that are not recycled or reused are usually shredded and disposed of in landfills, or stockpiled whole. Stockpiling whole tires creates two significant hazards: mosquitoes and fires.

### 3.5. Yard Waste

Yard waste is defined as the part of solid waste composed of vegetative matter resulting from landscaping maintenance or land clearing operations and includes materials such as tree and shrub trimmings, grass clippings, palm fronds, trees and tree stumps (Chapter 62-701, Florida Administrative Code). In Florida yard waste is banned from disposal in lined landfill facilities. It is collected either by separate curbside collection or by the use of drop off facilities where a resident can go and drop off the yard waste. Disposal pathways for yard waste include: mulch, composting/co-composting, tilled into the soil, and combustion.

# 4. C&D DEBRIS WOOD WASTE

## 4.1. Fuel Description

Construction and demolition debris wood waste represents a large component of the US waste stream. Such wood is also combustible and a renewable resource and thus represents a possible sustainable fuel source. Currently, the reuse and recycling of C&D debris wood waste in the US is limited by economics. It is simply less expensive to utilize new wood, alternative fuels, or alternative materials for applications for which waste wood can be used. Recycling of C&D debris wood is also hindered by contaminants found in wood, including paints (including lead-based paint), adhesives, and chemical preservatives (especially chromate copper arsenate). As a fuel source, wood from construction is more widely accepted than demolition wood as it is generally cleaner and relatively easier to separate for contaminants.

## 4.2. Current Management

The method by which structures and materials are removed from service plays a large role in its management. Demolition typically involves the removal of a structure in bulk using heavy equipment without attempts to recover reusable materials. Prior to 1990 wood waste recycling was extremely limited (US EPA 1998). Today the current market for wood waste (both C&D debris waste wood and virgin waste wood) is dominated by mulch and fuel applications (US EPA 1998). C&D debris waste wood is particularly attractive as a fuel because of its low moisture content (US EPA 2005b). Other smaller applications include reuse for other applications requiring dimensional wood, use of wood as a composting agent, animal bedding, or for the manufacture of particleboard or fiberboard. The major disposal pathway as of date for C&D wood waste stream is through a C&D debris recycling facility (converted to mulch or boiler fuel) or the disposal in C&D debris landfills. In the region of the present study most of the C&D debris wood waste is disposed of in unlined C&D landfills.

## 4.3. Waste Projection

For the C&D debris wood waste projection in the study area, the quantity of wood waste was calculated using the values reported by the various counties for total C&D waste generation. It is assumed that 20% of total C&D debris waste is composed of wood based on typical values found in the literature (details presented in the appendix). The amount of C&D debris wood waste

produced at different counties within the region of the study was projected using the projected population data and rate of wood waste production (Table 4-1).

Table 4-1. County level C&D wood waste projections (in tons) for the next 5 years.

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14,140 | 14,364 | 14,581 | 14,794 | 15,017 | 15,238 |
| Baker | Florida | 156 | 159 | 162 | 165 | 167 | 169 |
| Bay | Florida | 11,714 | 11,903 | 12,083 | 12,257 | 12,435 | 12,611 |
| Bradford | Florida | 309 | 313 | 316 | 319 | 322 | 325 |
| Calhoun | Florida | 72 | 73 | 73 | 74 | 74 | 75 |
| Citrus | Florida | 18,929 | 19,328 | 19,708 | 20,078 | 20,463 | 20,841 |
| Clay | Florida | 4,186 | 4,315 | 4,442 | 4,566 | 4,690 | 4,812 |
| Columbia | Florida | 2,294 | 2,346 | 2,400 | 2,453 | 2,495 | 2,536 |
| Dixie | Florida | 2,099 | 2,141 | 2,176 | 2,211 | 2,250 | 2,289 |
| Duval | Florida | 82,132 | 83,436 | 84,696 | 85,931 | 87,228 | 88,510 |
| Flagler | Florida | 21,420 | 22,527 | 23,463 | 24,306 | 25,448 | 26,578 |
| Franklin | Florida | 566 | 589 | 612 | 633 | 643 | 651 |
| Gadsden | Florida | 862 | 870 | 877 | 882 | 889 | 895 |
| Gilchrist | Florida | 145 | 149 | 154 | 158 | 162 | 166 |
| Gulf | Florida | 1,065 | 1,076 | 1,085 | 1,093 | 1,102 | 1,112 |
| Hamilton | Florida | 352 | 355 | 359 | 363 | 366 | 368 |
| Hernando | Florida | 14,985 | 15,331 | 15,645 | 15,942 | 16,289 | 16,632 |
| Holmes | Florida | 95 | 95 | 96 | 97 | 98 | 98 |
| Jackson | Florida | 232 | 236 | 239 | 241 | 243 | 245 |
| Jefferson | Florida | 212 | 214 | 216 | 218 | 220 | 222 |
| Lafayette | Florida | 73 | 74 | 74 | 74 | 74 | 75 |
| Lake | Florida | 38,457 | 39,806 | 41,119 | 42,406 | 43,706 | 44,990 |
| Leon | Florida | 50,237 | 51,103 | 51,902 | 52,657 | 53,563 | 54,460 |
| Levy | Florida | 877 | 898 | 920 | 942 | 961 | 979 |
| Liberty | Florida | 122 | 123 | 123 | 124 | 125 | 126 |
| Madison | Florida | 446 | 450 | 454 | 458 | 461 | 465 |
| Marion | Florida | 12,471 | 12,817 | 13,144 | 13,458 | 13,794 | 14,125 |
| Nassau | Florida | 3,037 | 3,123 | 3,216 | 3,313 | 3,390 | 3,466 |
| Orange | Florida | 149,995 | 154,221 | 158,450 | 162,652 | 166,647 | 170,582 |
| Pasco | Florida | 59,000 | 60,474 | 61,800 | 63,044 | 64,546 | 66,030 |
| Putnam | Florida | 2,614 | 2,636 | 2,660 | 2,683 | 2,704 | 2,726 |
| St. Johns | Florida | 10,181 | 10,573 | 10,949 | 11,316 | 11,697 | 12,075 |
| Sumter | Florida | 3,212 | 3,336 | 3,433 | 3,514 | 3,647 | 3,780 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Suwannee | Florida | 862 | 880 | 900 | 920 | 937 | 953 |
| Taylor | Florida | 175 | 178 | 180 | 183 | 186 | 188 |
| Union | Florida | 117 | 119 | 120 | 121 | 123 | 124 |
| Volusia | Florida | 81,799 | 83,402 | 84,986 | 86,545 | 88,067 | 89,563 |
| Wakulla | Florida | 484 | 505 | 525 | 544 | 560 | 574 |
| Walton | Florida | 18,791 | 19,089 | 19,377 | 19,660 | 19,957 | 20,250 |
| Washington | Florida | 201 | 207 | 213 | 218 | 222 | 225 |
| Baker | Georgia | 86 | 87 | 88 | 89 | 90 | 91 |
| Brantley | Georgia | 352 | 363 | 375 | 387 | 399 | 412 |
| Brooks | Georgia | 333 | 335 | 337 | 339 | 342 | 344 |
| Calhoun | Georgia | 146 | 150 | 154 | 158 | 162 | 166 |
| Camden | Georgia | 1,143 | 1,194 | 1,248 | 1,304 | 1,362 | 1,423 |
| Charlton | Georgia | 229 | 234 | 239 | 244 | 249 | 254 |
| Clinch | Georgia | 144 | 145 | 147 | 149 | 151 | 152 |
| Colquitt | Georgia | 898 | 911 | 925 | 938 | 952 | 966 |
| Cook | Georgia | 342 | 348 | 354 | 360 | 367 | 373 |
| Decatur | Georgia | 586 | 592 | 599 | 605 | 612 | 618 |
| Dougherty | Georgia | 1,855 | 1,855 | 1,856 | 1,856 | 1,857 | 1,857 |
| Early | Georgia | 245 | 246 | 247 | 248 | 249 | 250 |
| Echols | Georgia | 109 | 116 | 123 | 131 | 139 | 147 |
| Glynn | Georgia | 1,378 | 1,389 | 1,400 | 1,412 | 1,423 | 1,435 |
| Grady | Georgia | 512 | 520 | 529 | 538 | 547 | 556 |
| Lanier | Georgia | 173 | 178 | 184 | 189 | 195 | 201 |
| Lowndes | Georgia | 2,057 | 2,100 | 2,145 | 2,190 | 2,237 | 2,284 |
| McIntosh | Georgia | 250 | 256 | 263 | 269 | 276 | 283 |
| Miller | Georgia | 124 | 125 | 125 | 125 | 125 | 125 |
| Mitchell | Georgia | 523 | 532 | 542 | 551 | 561 | 572 |
| Pierce | Georgia | 340 | 346 | 352 | 358 | 364 | 370 |
| Seminole | Georgia | 186 | 186 | 187 | 188 | 189 | 189 |
| Thomas | Georgia | 881 | 890 | 899 | 907 | 916 | 925 |
| Ware | Georgia | 684 | 684 | 684 | 684 | 684 | 684 |
| Wayne | Georgia | 583 | 594 | 606 | 617 | 629 | 640 |
| Worth | Georgia | 458 | 463 | 468 | 474 | 479 | 484 |
| Henry | Alabama | 125 | 127 | 128 | 130 | 132 | 133 |
| Houston | Alabama | 148 | 150 | 152 | 154 | 156 | 158 |
| Geneva | Alabama | 805 | 806 | 816 | 826 | 837 | 848 |

Table 4-2 presents the energy value of the C&D debris wood waste projection in potential Btu of energy if all the wood produced is used as fuel. A value of 5,850 Btu/lb was used for the energy conversion. This value is the average heat value from the two studies related to wood combustion as presented in the previous chapter.

Table 4-2. County wide C&D debris wood waste projections (in billion Btu) for the next 5 years.

| **County** | **State** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 165.4 | 168.1 | 170.6 | 173.1 | 175.7 | 178.3 |
| Baker | Florida | 1.8 | 1.9 | 1.9 | 1.9 | 2.0 | 2.0 |
| Bay | Florida | 137.0 | 139.3 | 141.4 | 143.4 | 145.5 | 147.5 |
| Bradford | Florida | 3.6 | 3.7 | 3.7 | 3.7 | 3.8 | 3.8 |
| Calhoun | Florida | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 |
| Citrus | Florida | 221.5 | 226.1 | 230.6 | 234.9 | 239.4 | 243.8 |
| Clay | Florida | 49.0 | 50.5 | 52.0 | 53.4 | 54.9 | 56.3 |
| Columbia | Florida | 26.8 | 27.4 | 28.1 | 28.7 | 29.2 | 29.7 |
| Dixie | Florida | 24.6 | 25.0 | 25.5 | 25.9 | 26.3 | 26.8 |
| Duval | Florida | 960.9 | 976.2 | 990.9 | 1005.4 | 1020.6 | 1035.6 |
| Flagler | Florida | 250.6 | 263.6 | 274.5 | 284.4 | 297.7 | 311.0 |
| Franklin | Florida | 6.6 | 6.9 | 7.2 | 7.4 | 7.5 | 7.6 |
| Gadsden | Florida | 10.1 | 10.2 | 10.3 | 10.3 | 10.4 | 10.5 |
| Gilchrist | Florida | 1.7 | 1.7 | 1.8 | 1.8 | 1.9 | 1.9 |
| Gulf | Florida | 12.5 | 12.6 | 12.7 | 12.8 | 12.9 | 13.0 |
| Hamilton | Florida | 4.1 | 4.2 | 4.2 | 4.2 | 4.3 | 4.3 |
| Hernando | Florida | 175.3 | 179.4 | 183.1 | 186.5 | 190.6 | 194.6 |
| Holmes | Florida | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| Jackson | Florida | 2.7 | 2.8 | 2.8 | 2.8 | 2.8 | 2.9 |
| Jefferson | Florida | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 | 2.6 |
| Lafayette | Florida | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| Lake | Florida | 449.9 | 465.7 | 481.1 | 496.1 | 511.4 | 526.4 |
| Leon | Florida | 587.8 | 597.9 | 607.3 | 616.1 | 626.7 | 637.2 |
| Levy | Florida | 10.3 | 10.5 | 10.8 | 11.0 | 11.2 | 11.5 |
| Liberty | Florida | 1.4 | 1.4 | 1.4 | 1.4 | 1.5 | 1.5 |
| Madison | Florida | 5.2 | 5.3 | 5.3 | 5.4 | 5.4 | 5.4 |
| Marion | Florida | 145.9 | 150.0 | 153.8 | 157.5 | 161.4 | 165.3 |
| Nassau | Florida | 35.5 | 36.5 | 37.6 | 38.8 | 39.7 | 40.6 |
| Orange | Florida | 1754.9 | 1804.4 | 1853.9 | 1903.0 | 1949.8 | 1995.8 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Pasco | Florida | 690.3 | 707.5 | 723.1 | 737.6 | 755.2 | 772.5 |
| Putnam | Florida | 30.6 | 30.8 | 31.1 | 31.4 | 31.6 | 31.9 |
| St. Johns | Florida | 119.1 | 123.7 | 128.1 | 132.4 | 136.9 | 141.3 |
| Sumter | Florida | 37.6 | 39.0 | 40.2 | 41.1 | 42.7 | 44.2 |
| Suwannee | Florida | 10.1 | 10.3 | 10.5 | 10.8 | 11.0 | 11.2 |
| Taylor | Florida | 2.0 | 2.1 | 2.1 | 2.1 | 2.2 | 2.2 |
| Union | Florida | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.5 |
| Volusia | Florida | 957.0 | 975.8 | 994.3 | 1012.6 | 1030.4 | 1047.9 |
| Wakulla | Florida | 5.7 | 5.9 | 6.1 | 6.4 | 6.5 | 6.7 |
| Walton | Florida | 219.8 | 223.3 | 226.7 | 230.0 | 233.5 | 236.9 |
| Washington | Florida | 2.4 | 2.4 | 2.5 | 2.6 | 2.6 | 2.6 |
| Baker | Georgia | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 |
| Brantley | Georgia | 4.1 | 4.2 | 4.4 | 4.5 | 4.7 | 4.8 |
| Brooks | Georgia | 3.9 | 3.9 | 3.9 | 4.0 | 4.0 | 4.0 |
| Calhoun | Georgia | 1.7 | 1.8 | 1.8 | 1.8 | 1.9 | 1.9 |
| Camden | Georgia | 13.4 | 14.0 | 14.6 | 15.3 | 15.9 | 16.6 |
| Charlton | Georgia | 2.7 | 2.7 | 2.8 | 2.9 | 2.9 | 3.0 |
| Clinch | Georgia | 1.7 | 1.7 | 1.7 | 1.7 | 1.8 | 1.8 |
| Colquitt | Georgia | 10.5 | 10.7 | 10.8 | 11.0 | 11.1 | 11.3 |
| Cook | Georgia | 4.0 | 4.1 | 4.1 | 4.2 | 4.3 | 4.4 |
| Decatur | Georgia | 6.9 | 6.9 | 7.0 | 7.1 | 7.2 | 7.2 |
| Dougherty | Georgia | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 |
| Early | Georgia | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 |
| Echols | Georgia | 1.3 | 1.4 | 1.4 | 1.5 | 1.6 | 1.7 |
| Glynn | Georgia | 16.1 | 16.3 | 16.4 | 16.5 | 16.7 | 16.8 |
| Grady | Georgia | 6.0 | 6.1 | 6.2 | 6.3 | 6.4 | 6.5 |
| Lanier | Georgia | 2.0 | 2.1 | 2.1 | 2.2 | 2.3 | 2.4 |
| Lowndes | Georgia | 24.1 | 24.6 | 25.1 | 25.6 | 26.2 | 26.7 |
| McIntosh | Georgia | 2.9 | 3.0 | 3.1 | 3.2 | 3.2 | 3.3 |
| Miller | Georgia | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Mitchell | Georgia | 6.1 | 6.2 | 6.3 | 6.5 | 6.6 | 6.7 |
| Pierce | Georgia | 4.0 | 4.0 | 4.1 | 4.2 | 4.3 | 4.3 |
| Seminole | Georgia | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| Thomas | Georgia | 10.3 | 10.4 | 10.5 | 10.6 | 10.7 | 10.8 |
| Ware | Georgia | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Wayne | Georgia | 6.8 | 7.0 | 7.1 | 7.2 | 7.4 | 7.5 |
| Worth | Georgia | 5.4 | 5.4 | 5.5 | 5.5 | 5.6 | 5.7 |
| Henry | Alabama | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.6 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Houston | Alabama | 1.7 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Geneva | Alabama | 9.4 | 9.4 | 9.6 | 9.7 | 9.8 | 9.9 |

### 4.4. Feasibility Assessment

From the projected energy values from the C&D debris wood waste in various counties (from Table 4-2), a region specific calculation for the three facilities were completed. Within a specific region wood waste is collected at several C&D debris recycling facilities or is disposed of in a C&D debris landfill. The processing cost of C&D wood waste for fuel applications is approximately $20/metric ton (personal communication, Florida Wood Recycling, Town of Medley, 2007). The transportation cost was calculated based on the distance from the C&D disposal facility in the region and the corresponding nearest power plant facility. Tables 4-3 thru 4-5 present the delivered cost per MMBtu for the C&D wood waste from the different counties to the three power generation units targeted in this study. The scenario of all the waste from a specific county being available for all the three facilities is being presented (i.e., with no competing demand between facilities considered). The data calculation has been shown only for the year 2007. Similar calculations can be performed for other years. The major part of the cost is from the processing of waste before its use as fuel. As mentioned before in this document, the income from tipping fees has not been included in this calculation. The other two scenarios for the three facilities one considering two hour travel time from the waste collection center to the power plant (with no competing demand) and the other considering the 2-hour travel time with competing demand (and assuming that the waste goes to the nearest facility in case of two or more facilities being within a travel time range of 2-hour is presented for the three facilities in Table 4-6 thru 4-11.

Table 4-3. Delivered cost of C&D wood waste for the Deerhaven facility.

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14140 | 165.4 | 18 | 9.2 | 20 | 1 | 21.0 | 1.80 |
| Baker | Florida | 156 | 1.8 | 67 | 55 | 20 | 6 | 26.1 | 2.23 |
| Bay | Florida | 11714 | 137.0 | 266 | 266 | 20 | 29 | 49.3 | 4.21 |
| Bradford | Florida | 309 | 3.6 | 51 | 37 | 20 | 4 | 24.1 | 2.06 |
| Calhoun | Florida | 72 | 0.8 | 174 | 149 | 20 | 16 | 36.4 | 3.11 |
| Citrus | Florida | 18929 | 221.5 | 95 | 79 | 20 | 9 | 28.7 | 2.45 |
| Clay | Florida | 4186 | 49.0 | 78 | 60 | 20 | 7 | 26.6 | 2.27 |
| Columbia | Florida | 2294 | 26.8 | 52 | 51 | 20 | 6 | 25.6 | 2.19 |
| Dixie | Florida | 2099 | 24.6 | 52 | 44 | 20 | 5 | 24.8 | 2.12 |
| Duval | Florida | 82132 | 960.9 | 76 | 63 | 20 | 7 | 26.9 | 2.30 |
| Flagler | Florida | 21420 | 250.6 | 123 | 81 | 20 | 9 | 28.9 | 2.47 |
| Franklin | Florida | 566 | 6.6 | 222 | 208 | 20 | 23 | 42.9 | 3.66 |
| Gadsden | Florida | 862 | 10.1 | 152 | 167 | 20 | 18 | 38.4 | 3.28 |
| Gilchrist | Florida | 145 | 1.7 | 49 | 35 | 20 | 4 | 23.9 | 2.04 |
| Gulf | Florida | 1065 | 12.5 | 255 | 243 | 20 | 27 | 46.7 | 3.99 |
| Hamilton | Florida | 352 | 4.1 | 68 | 67 | 20 | 7 | 27.4 | 2.34 |
| Hernando | Florida | 14985 | 175.3 | 119 | 109 | 20 | 12 | 32.0 | 2.73 |
| Holmes | Florida | 95 | 1.1 | 208 | 234 | 20 | 26 | 45.7 | 3.91 |
| Jackson | Florida | 232 | 2.7 | 209 | 225 | 20 | 25 | 44.8 | 3.82 |
| Jefferson | Florida | 212 | 2.5 | 95 | 105 | 20 | 12 | 31.6 | 2.70 |
| Lafayette | Florida | 73 | 0.9 | 83 | 60 | 20 | 7 | 26.6 | 2.27 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 38457 | 449.9 | 99 | 99 | 20 | 11 | 30.9 | 2.64 |
| Leon | Florida | 50237 | 587.8 | 129 | 135 | 20 | 15 | 34.9 | 2.98 |
| Levy | Florida | 877 | 10.3 | 69 | 48 | 20 | 5 | 25.3 | 2.16 |
| Liberty | Florida | 122 | 1.4 | 173 | 185 | 20 | 20 | 40.4 | 3.45 |
| Madison | Florida | 446 | 5.2 | 95 | 105 | 20 | 12 | 31.6 | 2.70 |
| Marion | Florida | 12471 | 145.9 | 68 | 58 | 20 | 6 | 26.4 | 2.25 |
| Nassau | Florida | 3037 | 35.5 | 103 | 79 | 20 | 9 | 28.7 | 2.45 |
| Orange | Florida | 149995 | 1754.9 | 134 | 137 | 20 | 15 | 35.1 | 3.00 |
| Pasco | Florida | 59000 | 690.3 | 145 | 139 | 20 | 15 | 35.3 | 3.02 |
| Putnam | Florida | 2614 | 30.6 | 72 | 56 | 20 | 6 | 26.2 | 2.24 |
| St. Johns | Florida | 10181 | 119.1 | 112 | 85 | 20 | 9 | 29.4 | 2.51 |
| Sumter | Florida | 3212 | 37.6 | 79 | 80 | 20 | 9 | 28.8 | 2.46 |
| Suwannee | Florida | 862 | 10.1 | 63 | 66 | 20 | 7 | 27.3 | 2.33 |
| Taylor | Florida | 175 | 2.0 | 105 | 93 | 20 | 10 | 30.2 | 2.58 |
| Union | Florida | 117 | 1.4 | 62 | 47 | 20 | 5 | 25.2 | 2.15 |
| Volusia | Florida | 81799 | 957.0 | 120 | 111 | 20 | 12 | 32.2 | 2.75 |
| Wakulla | Florida | 484 | 5.7 | 160 | 164 | 20 | 18 | 38.0 | 3.25 |
| Walton | Florida | 18791 | 219.8 | 240 | 267 | 20 | 29 | 49.4 | 4.22 |
| Washington | Florida | 201 | 2.4 | 205 | 229 | 20 | 25 | 45.2 | 3.86 |
| Baker | Georgia | 86 | 1.0 | 187 | 185 | 20 | 20 | 40.4 | 3.45 |
| Brantley | Georgia | 352 | 4.1 | 163 | 119 | 20 | 13 | 33.1 | 2.83 |
| Brooks | Georgia | 333 | 3.9 | 109 | 116 | 20 | 13 | 32.8 | 2.80 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 146 | 1.7 | 228 | 214 | 20 | 24 | 43.5 | 3.72 |
| Camden | Georgia | 1143 | 13.4 | 135 | 116 | 20 | 13 | 32.8 | 2.80 |
| Charlton | Georgia | 229 | 2.7 | 131 | 97 | 20 | 11 | 30.7 | 2.62 |
| Clinch | Georgia | 144 | 1.7 | 133 | 135 | 20 | 15 | 34.9 | 2.98 |
| Colquitt | Georgia | 898 | 10.5 | 150 | 141 | 20 | 16 | 35.5 | 3.04 |
| Cook | Georgia | 342 | 4.0 | 112 | 121 | 20 | 13 | 33.3 | 2.85 |
| Decatur | Georgia | 586 | 6.9 | 174 | 185 | 20 | 20 | 40.4 | 3.45 |
| Dougherty | Georgia | 1855 | 21.7 | 178 | 178 | 20 | 20 | 39.6 | 3.38 |
| Early | Georgia | 245 | 2.9 | 227 | 224 | 20 | 25 | 44.6 | 3.82 |
| Echols | Georgia | 109 | 1.3 | 100 | 90 | 20 | 10 | 29.9 | 2.56 |
| Glynn | Georgia | 1378 | 16.1 | 153 | 145 | 20 | 16 | 36.0 | 3.07 |
| Grady | Georgia | 512 | 6.0 | 172 | 170 | 20 | 19 | 38.7 | 3.31 |
| Lanier | Georgia | 173 | 2.0 | 91 | 99 | 20 | 11 | 30.9 | 2.64 |
| Lowndes | Georgia | 2057 | 24.1 | 96 | 100 | 20 | 11 | 31.0 | 2.65 |
| McIntosh | Georgia | 250 | 2.9 | 175 | 164 | 20 | 18 | 38.0 | 3.25 |
| Miller | Georgia | 124 | 1.5 | 212 | 203 | 20 | 22 | 42.3 | 3.62 |
| Mitchell | Georgia | 523 | 6.1 | 173 | 164 | 20 | 18 | 38.0 | 3.25 |
| Pierce | Georgia | 340 | 4.0 | 174 | 147 | 20 | 16 | 36.2 | 3.09 |
| Seminole | Georgia | 186 | 2.2 | 212 | 203 | 20 | 22 | 42.3 | 3.62 |
| Thomas | Georgia | 881 | 10.3 | 140 | 138 | 20 | 15 | 35.2 | 3.01 |
| Ware | Georgia | 684 | 8.0 | 131 | 97 | 20 | 11 | 30.7 | 2.62 |
| Wayne | Georgia | 583 | 6.8 | 191 | 142 | 20 | 16 | 35.6 | 3.04 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 458 | 5.4 | 150 | 141 | 20 | 16 | 35.5 | 3.04 |
| Henry | Alabama | 125 | 1.5 | 270 | 273 | 20 | 30 | 50.0 | 4.28 |
| Houston | Alabama | 148 | 1.7 | 212 | 203 | 20 | 22 | 42.3 | 3.62 |
| Geneva | Alabama | 805 | 9.4 | 230 | 254 | 20 | 28 | 47.9 | 4.10 |

Table 4-4. Delivered cost of C&D wood waste for the JEA Brandy Branch facility.

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14140 | 165.4 | 69 | 53.5 | 20 | 6 | 25.9 | 2.21 |
| Baker | Florida | 156 | 1.8 | 23 | 23 | 20 | 3 | 22.5 | 1.93 |
| Bay | Florida | 11714 | 137.0 | 272 | 272 | 20 | 30 | 49.9 | 4.27 |
| Bradford | Florida | 309 | 3.6 | 36 | 32 | 20 | 4 | 23.5 | 2.01 |
| Calhoun | Florida | 72 | 0.8 | 167 | 154 | 20 | 17 | 36.9 | 3.16 |
| Citrus | Florida | 18929 | 221.5 | 150 | 122 | 20 | 13 | 33.4 | 2.86 |
| Clay | Florida | 4186 | 49.0 | 50 | 44 | 20 | 5 | 24.8 | 2.12 |
| Columbia | Florida | 2294 | 26.8 | 50 | 48 | 20 | 5 | 25.3 | 2.16 |
| Dixie | Florida | 2099 | 24.6 | 127 | 109 | 20 | 12 | 32.0 | 2.73 |
| Duval | Florida | 82132 | 960.9 | 8 | 8 | 20 | 1 | 20.9 | 1.78 |
| Flagler | Florida | 21420 | 250.6 | 96 | 87 | 20 | 10 | 29.6 | 2.53 |
| Franklin | Florida | 566 | 6.6 | 228 | 214 | 20 | 24 | 43.5 | 3.72 |
| Gadsden | Florida | 862 | 10.1 | 155 | 171 | 20 | 19 | 38.8 | 3.32 |
| Gilchrist | Florida | 145 | 1.7 | 100 | 100 | 20 | 11 | 31.0 | 2.65 |
| Gulf | Florida | 1065 | 12.5 | 261 | 249 | 20 | 27 | 47.4 | 4.05 |
| Hamilton | Florida | 352 | 4.1 | 76 | 73 | 20 | 8 | 28.0 | 2.40 |
| Hernando | Florida | 14985 | 175.3 | 175 | 152 | 20 | 17 | 36.7 | 3.14 |
| Holmes | Florida | 95 | 1.1 | 210 | 239 | 20 | 26 | 46.3 | 3.96 |
| Jackson | Florida | 232 | 2.7 | 215 | 232 | 20 | 26 | 45.5 | 3.89 |
| Jefferson | Florida | 212 | 2.5 | 98 | 110 | 20 | 12 | 32.1 | 2.74 |
| Lafayette | Florida | 73 | 0.9 | 105 | 96 | 20 | 11 | 30.6 | 2.61 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 38457 | 449.9 | 165 | 142 | 20 | 16 | 35.6 | 3.04 |
| Leon | Florida | 50237 | 587.8 | 135 | 141 | 20 | 16 | 35.5 | 3.04 |
| Levy | Florida | 877 | 10.3 | 128 | 93 | 20 | 10 | 30.2 | 2.58 |
| Liberty | Florida | 122 | 1.4 | 176 | 190 | 20 | 21 | 40.9 | 3.50 |
| Madison | Florida | 446 | 5.2 | 98 | 110 | 20 | 12 | 32.1 | 2.74 |
| Marion | Florida | 12471 | 145.9 | 117 | 92 | 20 | 10 | 30.1 | 2.57 |
| Nassau | Florida | 3037 | 35.5 | 33 | 25 | 20 | 3 | 22.8 | 1.94 |
| Orange | Florida | 149995 | 1754.9 | 161 | 167 | 20 | 18 | 38.4 | 3.28 |
| Pasco | Florida | 59000 | 690.3 | 200 | 182 | 20 | 20 | 40.0 | 3.42 |
| Putnam | Florida | 2614 | 30.6 | 85 | 67 | 20 | 7 | 27.4 | 2.34 |
| St. Johns | Florida | 10181 | 119.1 | 67 | 65 | 20 | 7 | 27.2 | 2.32 |
| Sumter | Florida | 3212 | 37.6 | 134 | 123 | 20 | 14 | 33.5 | 2.87 |
| Suwannee | Florida | 862 | 10.1 | 66 | 71 | 20 | 8 | 27.8 | 2.38 |
| Taylor | Florida | 175 | 2.0 | 134 | 135 | 20 | 15 | 34.9 | 2.98 |
| Union | Florida | 117 | 1.4 | 34 | 28 | 20 | 3 | 23.1 | 1.97 |
| Volusia | Florida | 81799 | 957.0 | 101 | 112 | 20 | 12 | 32.3 | 2.76 |
| Wakulla | Florida | 484 | 5.7 | 182 | 170 | 20 | 19 | 38.7 | 3.31 |
| Walton | Florida | 18791 | 219.8 | 240 | 272 | 20 | 30 | 49.9 | 4.27 |
| Washington | Florida | 201 | 2.4 | 207 | 234 | 20 | 26 | 45.7 | 3.91 |
| Baker | Georgia | 86 | 1.0 | 190 | 190 | 20 | 21 | 40.9 | 3.50 |
| Brantley | Georgia | 352 | 4.1 | 94 | 71 | 20 | 8 | 27.8 | 2.38 |
| Brooks | Georgia | 333 | 3.9 | 112 | 120 | 20 | 13 | 33.2 | 2.84 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 146 | 1.7 | 234 | 220 | 20 | 24 | 44.2 | 3.78 |
| Camden | Georgia | 1143 | 13.4 | 70 | 60 | 20 | 7 | 26.6 | 2.27 |
| Charlton | Georgia | 229 | 2.7 | 69 | 50 | 20 | 6 | 25.5 | 2.18 |
| Clinch | Georgia | 144 | 1.7 | 113 | 88 | 20 | 10 | 29.7 | 2.54 |
| Colquitt | Georgia | 898 | 10.5 | 155 | 147 | 20 | 16 | 36.2 | 3.09 |
| Cook | Georgia | 342 | 4.0 | 118 | 127 | 20 | 14 | 34.0 | 2.90 |
| Decatur | Georgia | 586 | 6.9 | 177 | 190 | 20 | 21 | 40.9 | 3.50 |
| Dougherty | Georgia | 1855 | 21.7 | 185 | 185 | 20 | 20 | 40.4 | 3.45 |
| Early | Georgia | 245 | 2.9 | 229 | 229 | 20 | 25 | 45.2 | 3.86 |
| Echols | Georgia | 109 | 1.3 | 93 | 78 | 20 | 9 | 28.6 | 2.44 |
| Glynn | Georgia | 1378 | 16.1 | 86 | 91 | 20 | 10 | 30.0 | 2.56 |
| Grady | Georgia | 512 | 6.0 | 178 | 177 | 20 | 19 | 39.5 | 3.37 |
| Lanier | Georgia | 173 | 2.0 | 94 | 104 | 20 | 11 | 31.4 | 2.69 |
| Lowndes | Georgia | 2057 | 24.1 | 102 | 106 | 20 | 12 | 31.7 | 2.71 |
| McIntosh | Georgia | 250 | 2.9 | 109 | 108 | 20 | 12 | 31.9 | 2.72 |
| Miller | Georgia | 124 | 1.5 | 218 | 209 | 20 | 23 | 43.0 | 3.67 |
| Mitchell | Georgia | 523 | 6.1 | 180 | 171 | 20 | 19 | 38.8 | 3.32 |
| Pierce | Georgia | 340 | 4.0 | 107 | 92 | 20 | 10 | 30.1 | 2.57 |
| Seminole | Georgia | 186 | 2.2 | 218 | 209 | 20 | 23 | 43.0 | 3.67 |
| Thomas | Georgia | 881 | 10.3 | 147 | 144 | 20 | 16 | 35.8 | 3.06 |
| Ware | Georgia | 684 | 8.0 | 69 | 50 | 20 | 6 | 25.5 | 2.18 |
| Wayne | Georgia | 583 | 6.8 | 121 | 93 | 20 | 10 | 30.2 | 2.58 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 458 | 5.4 | 155 | 147 | 20 | 16 | 36.2 | 3.09 |
| Henry | Alabama | 125 | 1.5 | 265 | 254 | 20 | 28 | 47.9 | 4.10 |
| Houston | Alabama | 148 | 1.7 | 218 | 209 | 20 | 23 | 43.0 | 3.67 |
| Geneva | Alabama | 805 | 9.4 | 240 | 261 | 20 | 29 | 48.7 | 4.16 |

Table 4-5. Delivered cost of C&D wood waste for the TAL Hopkins facility.

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14140 | 165.4 | 154 | 159 | 20 | 17 | 37.5 | 3.20 |
| Baker | Florida | 156 | 1.8 | 122 | 135 | 20 | 15 | 34.9 | 2.98 |
| Bay | Florida | 11714 | 137.0 | 147 | 126 | 20 | 14 | 33.9 | 2.89 |
| Bradford | Florida | 309 | 3.6 | 161 | 164 | 20 | 18 | 38.0 | 3.25 |
| Calhoun | Florida | 72 | 0.8 | 9 | 4 | 20 | 0 | 20.4 | 1.75 |
| Citrus | Florida | 18929 | 221.5 | 218 | 221 | 20 | 24 | 44.3 | 3.79 |
| Clay | Florida | 4186 | 49.0 | 181 | 192 | 20 | 21 | 41.1 | 3.51 |
| Columbia | Florida | 2294 | 26.8 | 108 | 112 | 20 | 12 | 32.3 | 2.76 |
| Dixie | Florida | 2099 | 24.6 | 118 | 114 | 20 | 13 | 32.5 | 2.78 |
| Duval | Florida | 82132 | 960.9 | 140 | 157 | 20 | 17 | 37.3 | 3.19 |
| Flagler | Florida | 21420 | 250.6 | 230 | 239 | 20 | 26 | 46.3 | 3.96 |
| Franklin | Florida | 566 | 6.6 | 99 | 72 | 20 | 8 | 27.9 | 2.39 |
| Gadsden | Florida | 862 | 10.1 | 31 | 24 | 20 | 3 | 22.6 | 1.94 |
| Gilchrist | Florida | 145 | 1.7 | 148 | 151 | 20 | 17 | 36.6 | 3.13 |
| Gulf | Florida | 1065 | 12.5 | 136 | 97 | 20 | 11 | 30.7 | 2.62 |
| Hamilton | Florida | 352 | 4.1 | 110 | 106 | 20 | 12 | 31.7 | 2.71 |
| Hernando | Florida | 14985 | 175.3 | 231 | 187 | 20 | 21 | 40.6 | 3.47 |
| Holmes | Florida | 95 | 1.1 | 66 | 91 | 20 | 10 | 30.0 | 2.56 |
| Jackson | Florida | 232 | 2.7 | 90 | 86 | 20 | 9 | 29.5 | 2.52 |
| Jefferson | Florida | 212 | 2.5 | 52 | 53 | 20 | 6 | 25.8 | 2.21 |
| Lafayette | Florida | 73 | 0.9 | 111 | 102 | 20 | 11 | 31.2 | 2.67 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 38457 | 449.9 | 233 | 241 | 20 | 27 | 46.5 | 3.98 |
| Leon | Florida | 50237 | 587.8 | 23 | 11 | 20 | 1 | 21.2 | 1.81 |
| Levy | Florida | 877 | 10.3 | 170 | 137 | 20 | 15 | 35.1 | 3.00 |
| Liberty | Florida | 122 | 1.4 | 46 | 33 | 20 | 4 | 23.6 | 2.02 |
| Madison | Florida | 446 | 5.2 | 52 | 53 | 20 | 6 | 25.8 | 2.21 |
| Marion | Florida | 12471 | 145.9 | 192 | 200 | 20 | 22 | 42.0 | 3.59 |
| Nassau | Florida | 3037 | 35.5 | 155 | 178 | 20 | 20 | 39.6 | 3.38 |
| Orange | Florida | 149995 | 1754.9 | 257 | 279 | 20 | 31 | 50.7 | 4.33 |
| Pasco | Florida | 59000 | 690.3 | 268 | 281 | 20 | 31 | 50.9 | 4.35 |
| Putnam | Florida | 2614 | 30.6 | 204 | 206 | 20 | 23 | 42.7 | 3.65 |
| St. Johns | Florida | 10181 | 119.1 | 198 | 213 | 20 | 23 | 43.4 | 3.71 |
| Sumter | Florida | 3212 | 37.6 | 202 | 222 | 20 | 24 | 44.4 | 3.80 |
| Suwannee | Florida | 862 | 10.1 | 91 | 97 | 20 | 11 | 30.7 | 2.62 |
| Taylor | Florida | 175 | 2.0 | 73 | 71 | 20 | 8 | 27.8 | 2.38 |
| Union | Florida | 117 | 1.4 | 145 | 153 | 20 | 17 | 36.8 | 3.15 |
| Volusia | Florida | 81799 | 957.0 | 232 | 260 | 20 | 29 | 48.6 | 4.15 |
| Wakulla | Florida | 484 | 5.7 | 33 | 24 | 20 | 3 | 22.6 | 1.94 |
| Walton | Florida | 18791 | 219.8 | 117 | 124 | 20 | 14 | 33.6 | 2.88 |
| Washington | Florida | 201 | 2.4 | 83 | 86 | 20 | 9 | 29.5 | 2.52 |
| Baker | Georgia | 86 | 1.0 | 97 | 75 | 20 | 8 | 28.3 | 2.41 |
| Brantley | Georgia | 352 | 4.1 | 231 | 215 | 20 | 24 | 43.7 | 3.73 |
| Brooks | Georgia | 333 | 3.9 | 83 | 67 | 20 | 7 | 27.4 | 2.34 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 146 | 1.7 | 130 | 92 | 20 | 10 | 30.1 | 2.57 |
| Camden | Georgia | 1143 | 13.4 | 208 | 214 | 20 | 24 | 43.5 | 3.72 |
| Charlton | Georgia | 229 | 2.7 | 200 | 192 | 20 | 21 | 41.1 | 3.51 |
| Clinch | Georgia | 144 | 1.7 | 142 | 121 | 20 | 13 | 33.3 | 2.85 |
| Colquitt | Georgia | 898 | 10.5 | 90 | 66 | 20 | 7 | 27.3 | 2.33 |
| Cook | Georgia | 342 | 4.0 | 119 | 83 | 20 | 9 | 29.1 | 2.49 |
| Decatur | Georgia | 586 | 6.9 | 52 | 42 | 20 | 5 | 24.6 | 2.10 |
| Dougherty | Georgia | 1855 | 21.7 | 133 | 92 | 20 | 10 | 30.1 | 2.57 |
| Early | Georgia | 245 | 2.9 | 95 | 81 | 20 | 9 | 28.9 | 2.47 |
| Echols | Georgia | 109 | 1.3 | 130 | 114 | 20 | 13 | 32.5 | 2.78 |
| Glynn | Georgia | 1378 | 16.1 | 217 | 239 | 20 | 26 | 46.3 | 3.96 |
| Grady | Georgia | 512 | 6.0 | 55 | 32 | 20 | 4 | 23.5 | 2.01 |
| Lanier | Georgia | 173 | 2.0 | 101 | 85 | 20 | 9 | 29.4 | 2.51 |
| Lowndes | Georgia | 2057 | 24.1 | 101 | 79 | 20 | 9 | 28.7 | 2.45 |
| McIntosh | Georgia | 250 | 2.9 | 247 | 263 | 20 | 29 | 48.9 | 4.18 |
| Miller | Georgia | 124 | 1.5 | 96 | 67 | 20 | 7 | 27.4 | 2.34 |
| Mitchell | Georgia | 523 | 6.1 | 94 | 63 | 20 | 7 | 26.9 | 2.30 |
| Pierce | Georgia | 340 | 4.0 | 189 | 155 | 20 | 17 | 37.1 | 3.17 |
| Seminole | Georgia | 186 | 2.2 | 96 | 67 | 20 | 7 | 27.4 | 2.34 |
| Thomas | Georgia | 881 | 10.3 | 55 | 41 | 20 | 5 | 24.5 | 2.09 |
| Ware | Georgia | 684 | 8.0 | 199 | 192 | 20 | 21 | 41.1 | 3.51 |
| Wayne | Georgia | 583 | 6.8 | 241 | 186 | 20 | 20 | 40.5 | 3.46 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 458 | 5.4 | 90 | 65 | 20 | 7 | 27.2 | 2.32 |
| Henry | Alabama | 125 | 1.5 | 115 | 112 | 20 | 12 | 32.3 | 2.76 |
| Houston | Alabama | 148 | 1.7 | 96 | 71 | 20 | 8 | 27.8 | 2.38 |
| Geneva | Alabama | 805 | 9.4 | 90 | 110 | 20 | 12 | 32.1 | 2.74 |

Table 4-6. Delivered cost of C&D wood waste for the Deerhaven facility (within a 2-hour travel time).

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14140 | 165.4 | 18 | 9.2 | 20 | 1 | 21.0 | 1.80 |
| Baker | Florida | 156 | 1.8 | 67 | 55 | 20 | 6 | 26.1 | 2.23 |
| Bradford | Florida | 309 | 3.6 | 51 | 37 | 20 | 4 | 24.1 | 2.06 |
| Citrus | Florida | 18929 | 221.5 | 95 | 79 | 20 | 9 | 28.7 | 2.45 |
| Clay | Florida | 4186 | 49.0 | 78 | 60 | 20 | 7 | 26.6 | 2.27 |
| Columbia | Florida | 2294 | 26.8 | 52 | 51 | 20 | 6 | 25.6 | 2.19 |
| Dixie | Florida | 2099 | 24.6 | 52 | 44 | 20 | 5 | 24.8 | 2.12 |
| Duval | Florida | 82132 | 960.9 | 76 | 63 | 20 | 7 | 26.9 | 2.30 |
| Gilchrist | Florida | 145 | 1.7 | 49 | 35 | 20 | 4 | 23.9 | 2.04 |
| Hamilton | Florida | 352 | 4.1 | 68 | 67 | 20 | 7 | 27.4 | 2.34 |
| Hernando | Florida | 14985 | 175.3 | 119 | 109 | 20 | 12 | 32.0 | 2.73 |
| Jefferson | Florida | 212 | 2.5 | 95 | 105 | 20 | 12 | 31.6 | 2.70 |
| Lafayette | Florida | 73 | 0.9 | 83 | 60 | 20 | 7 | 26.6 | 2.27 |
| Lake | Florida | 38457 | 449.9 | 99 | 99 | 20 | 11 | 30.9 | 2.64 |
| Levy | Florida | 877 | 10.3 | 69 | 48 | 20 | 5 | 25.3 | 2.16 |
| Madison | Florida | 446 | 5.2 | 95 | 105 | 20 | 12 | 31.6 | 2.70 |
| Marion | Florida | 12471 | 145.9 | 68 | 58 | 20 | 6 | 26.4 | 2.25 |
| Nassau | Florida | 3037 | 35.5 | 103 | 79 | 20 | 9 | 28.7 | 2.45 |
| Putnam | Florida | 2614 | 30.6 | 72 | 56 | 20 | 6 | 26.2 | 2.24 |
| St. Johns | Florida | 10181 | 119.1 | 112 | 85 | 20 | 9 | 29.4 | 2.51 |
| Sumter | Florida | 3212 | 37.6 | 79 | 80 | 20 | 9 | 28.8 | 2.46 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Suwannee | Florida | 862 | 10.1 | 63 | 66 | 20 | 7 | 27.3 | 2.33 |
| Taylor | Florida | 175 | 2.0 | 105 | 93 | 20 | 10 | 30.2 | 2.58 |
| Union | Florida | 117 | 1.4 | 62 | 47 | 20 | 5 | 25.2 | 2.15 |
| Volusia | Florida | 81799 | 957.0 | 120 | 111 | 20 | 12 | 32.2 | 2.75 |
| Brooks | Georgia | 333 | 3.9 | 109 | 116 | 20 | 13 | 32.8 | 2.80 |
| Cook | Georgia | 342 | 4.0 | 112 | 121 | 20 | 13 | 33.3 | 2.85 |
| Echols | Georgia | 109 | 1.3 | 100 | 90 | 20 | 10 | 29.9 | 2.56 |
| Lanier | Georgia | 173 | 2.0 | 91 | 99 | 20 | 11 | 30.9 | 2.64 |
| Lowndes | Georgia | 2057 | 24.1 | 96 | 100 | 20 | 11 | 31.0 | 2.65 |

Table 4-7. Delivered cost of C&D wood waste for the Deerhaven facility (within a 2-hour travel time with competing demand)

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14140 | 165.4 | 18 | 9.2 | 20 | 1 | 21.0 | 1.80 |
| Citrus | Florida | 18929 | 221.5 | 95 | 79 | 20 | 9 | 28.7 | 2.45 |
| Dixie | Florida | 2099 | 24.6 | 52 | 44 | 20 | 5 | 24.8 | 2.12 |
| Gilchrist | Florida | 145 | 1.7 | 49 | 35 | 20 | 4 | 23.9 | 2.04 |
| Hamilton | Florida | 352 | 4.1 | 68 | 67 | 20 | 7 | 27.4 | 2.34 |
| Hernando | Florida | 14985 | 175.3 | 119 | 109 | 20 | 12 | 32.0 | 2.73 |
| Lafayette | Florida | 73 | 0.9 | 83 | 60 | 20 | 7 | 26.6 | 2.27 |
| Lake | Florida | 38457 | 449.9 | 99 | 99 | 20 | 11 | 30.9 | 2.64 |
| Levy | Florida | 877 | 10.3 | 69 | 48 | 20 | 5 | 25.3 | 2.16 |
| Marion | Florida | 12471 | 145.9 | 68 | 58 | 20 | 6 | 26.4 | 2.25 |
| Putnam | Florida | 2614 | 30.6 | 72 | 56 | 20 | 6 | 26.2 | 2.24 |
| Sumter | Florida | 3212 | 37.6 | 79 | 80 | 20 | 9 | 28.8 | 2.46 |
| Suwannee | Florida | 862 | 10.1 | 63 | 66 | 20 | 7 | 27.3 | 2.33 |
| Cook | Georgia | 342 | 4.0 | 112 | 121 | 20 | 13 | 33.3 | 2.85 |
| Lanier | Georgia | 173 | 2.0 | 91 | 99 | 20 | 11 | 30.9 | 2.64 |
| Lowndes | Georgia | 2057 | 24.1 | 96 | 100 | 20 | 11 | 31.0 | 2.65 |

Table 4-8. Delivered cost of C&D wood waste for the JEA Brandy Branch facility (within a 2-hour travel time)

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 14140 | 165.4 | 69 | 53.5 | 20 | 6 | 25.9 | 2.21 |
| Baker | Florida | 156 | 1.8 | 23 | 23 | 20 | 3 | 22.5 | 1.93 |
| Bradford | Florida | 309 | 3.6 | 36 | 32 | 20 | 4 | 23.5 | 2.01 |
| Clay | Florida | 4186 | 49.0 | 50 | 44 | 20 | 5 | 24.8 | 2.12 |
| Columbia | Florida | 2294 | 26.8 | 50 | 48 | 20 | 5 | 25.3 | 2.16 |
| Duval | Florida | 82132 | 960.9 | 8 | 8 | 20 | 1 | 20.9 | 1.78 |
| Flagler | Florida | 21420 | 250.6 | 96 | 87 | 20 | 10 | 29.6 | 2.53 |
| Gilchrist | Florida | 145 | 1.7 | 100 | 100 | 20 | 11 | 31.0 | 2.65 |
| Hamilton | Florida | 352 | 4.1 | 76 | 73 | 20 | 8 | 28.0 | 2.40 |
| Jefferson | Florida | 212 | 2.5 | 98 | 110 | 20 | 12 | 32.1 | 2.74 |
| Lafayette | Florida | 73 | 0.9 | 105 | 96 | 20 | 11 | 30.6 | 2.61 |
| Madison | Florida | 446 | 5.2 | 98 | 110 | 20 | 12 | 32.1 | 2.74 |
| Marion | Florida | 12471 | 145.9 | 117 | 92 | 20 | 10 | 30.1 | 2.57 |
| Nassau | Florida | 3037 | 35.5 | 33 | 25 | 20 | 3 | 22.8 | 1.94 |
| Putnam | Florida | 2614 | 30.6 | 85 | 67 | 20 | 7 | 27.4 | 2.34 |
| St. Johns | Florida | 10181 | 119.1 | 67 | 65 | 20 | 7 | 27.2 | 2.32 |
| Suwannee | Florida | 862 | 10.1 | 66 | 71 | 20 | 8 | 27.8 | 2.38 |
| Union | Florida | 117 | 1.4 | 34 | 28 | 20 | 3 | 23.1 | 1.97 |
| Volusia | Florida | 81799 | 957.0 | 101 | 112 | 20 | 12 | 32.3 | 2.76 |
| Brantley | Georgia | 352 | 4.1 | 94 | 71 | 20 | 8 | 27.8 | 2.38 |
| Brooks | Georgia | 333 | 3.9 | 112 | 120 | 20 | 13 | 33.2 | 2.84 |
| Camden | Georgia | 1143 | 13.4 | 70 | 60 | 20 | 7 | 26.6 | 2.27 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Charlton | Georgia | 229 | 2.7 | 69 | 50 | 20 | 6 | 25.5 | 2.18 |
| Clinch | Georgia | 144 | 1.7 | 113 | 88 | 20 | 10 | 29.7 | 2.54 |
| Cook | Georgia | 342 | 4.0 | 118 | 127 | 20 | 14 | 34.0 | 2.90 |
| Echols | Georgia | 109 | 1.3 | 93 | 78 | 20 | 9 | 28.6 | 2.44 |
| Glynn | Georgia | 1378 | 16.1 | 86 | 91 | 20 | 10 | 30.0 | 2.56 |
| Lanier | Georgia | 173 | 2.0 | 94 | 104 | 20 | 11 | 31.4 | 2.69 |
| Lowndes | Georgia | 2057 | 24.1 | 102 | 106 | 20 | 12 | 31.7 | 2.71 |
| McIntosh | Georgia | 250 | 2.9 | 109 | 108 | 20 | 12 | 31.9 | 2.72 |
| Pierce | Georgia | 340 | 4.0 | 107 | 92 | 20 | 10 | 30.1 | 2.57 |
| Ware | Georgia | 684 | 8.0 | 69 | 50 | 20 | 6 | 25.5 | 2.18 |

Table 4-9. Delivered cost of C&D wood waste for the JEA Brandy Branch facility (within a 2-hour travel time with competing demand)

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Baker | Florida | 156 | 1.8 | 23 | 23 | 20 | 3 | 22.5 | 1.93 |
| Bradford | Florida | 309 | 3.6 | 36 | 32 | 20 | 4 | 23.5 | 2.01 |
| Clay | Florida | 4186 | 49.0 | 50 | 44 | 20 | 5 | 24.8 | 2.12 |
| Columbia | Florida | 2294 | 26.8 | 50 | 48 | 20 | 5 | 25.3 | 2.16 |
| Duval | Florida | 82132 | 960.9 | 8 | 8 | 20 | 1 | 20.9 | 1.78 |
| Flagler | Florida | 21420 | 250.6 | 96 | 87 | 20 | 10 | 29.6 | 2.53 |
| Nassau | Florida | 3037 | 35.5 | 33 | 25 | 20 | 3 | 22.8 | 1.94 |
| St. Johns | Florida | 10181 | 119.1 | 67 | 65 | 20 | 7 | 27.2 | 2.32 |
| Union | Florida | 117 | 1.4 | 34 | 28 | 20 | 3 | 23.1 | 1.97 |
| Volusia | Florida | 81799 | 957.0 | 101 | 112 | 20 | 12 | 32.3 | 2.76 |
| Brantley | Georgia | 352 | 4.1 | 94 | 71 | 20 | 8 | 27.8 | 2.38 |
| Camden | Georgia | 1143 | 13.4 | 70 | 60 | 20 | 7 | 26.6 | 2.27 |
| Charlton | Georgia | 229 | 2.7 | 69 | 50 | 20 | 6 | 25.5 | 2.18 |
| Clinch | Georgia | 144 | 1.7 | 113 | 88 | 20 | 10 | 29.7 | 2.54 |
| Echols | Georgia | 109 | 1.3 | 93 | 78 | 20 | 9 | 28.6 | 2.44 |
| Glynn | Georgia | 1378 | 16.1 | 86 | 91 | 20 | 10 | 30.0 | 2.56 |
| McIntosh | Georgia | 250 | 2.9 | 109 | 108 | 20 | 12 | 31.9 | 2.72 |
| Pierce | Georgia | 340 | 4.0 | 107 | 92 | 20 | 10 | 30.1 | 2.57 |
| Ware | Georgia | 684 | 8.0 | 69 | 50 | 20 | 6 | 25.5 | 2.18 |

Table 4-10. Delivered cost of C&D wood waste for the TAL Hopkins facility (within a 2-hour travel time)

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 72 | 0.8 | 9 | 4 | 20 | 0 | 20.4 | 1.75 |
| Columbia | Florida | 2294 | 26.8 | 108 | 112 | 20 | 12 | 32.3 | 2.76 |
| Dixie | Florida | 2099 | 24.6 | 118 | 114 | 20 | 13 | 32.5 | 2.78 |
| Franklin | Florida | 566 | 6.6 | 99 | 72 | 20 | 8 | 27.9 | 2.39 |
| Gadsden | Florida | 862 | 10.1 | 31 | 24 | 20 | 3 | 22.6 | 1.94 |
| Hamilton | Florida | 352 | 4.1 | 110 | 106 | 20 | 12 | 31.7 | 2.71 |
| Holmes | Florida | 95 | 1.1 | 66 | 91 | 20 | 10 | 30.0 | 2.56 |
| Jackson | Florida | 232 | 2.7 | 90 | 86 | 20 | 9 | 29.5 | 2.52 |
| Jefferson | Florida | 212 | 2.5 | 52 | 53 | 20 | 6 | 25.8 | 2.21 |
| Lafayette | Florida | 73 | 0.9 | 111 | 102 | 20 | 11 | 31.2 | 2.67 |
| Leon | Florida | 50237 | 587.8 | 23 | 11 | 20 | 1 | 21.2 | 1.81 |
| Liberty | Florida | 122 | 1.4 | 46 | 33 | 20 | 4 | 23.6 | 2.02 |
| Madison | Florida | 446 | 5.2 | 52 | 53 | 20 | 6 | 25.8 | 2.21 |
| Suwannee | Florida | 862 | 10.1 | 91 | 97 | 20 | 11 | 30.7 | 2.62 |
| Taylor | Florida | 175 | 2.0 | 73 | 71 | 20 | 8 | 27.8 | 2.38 |
| Wakulla | Florida | 484 | 5.7 | 33 | 24 | 20 | 3 | 22.6 | 1.94 |
| Walton | Florida | 18791 | 219.8 | 117 | 124 | 20 | 14 | 33.6 | 2.88 |
| Washington | Florida | 201 | 2.4 | 83 | 86 | 20 | 9 | 29.5 | 2.52 |
| Baker | Georgia | 86 | 1.0 | 97 | 75 | 20 | 8 | 28.3 | 2.41 |
| Brooks | Georgia | 333 | 3.9 | 83 | 67 | 20 | 7 | 27.4 | 2.34 |
| Colquitt | Georgia | 898 | 10.5 | 90 | 66 | 20 | 7 | 27.3 | 2.33 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Cook | Georgia | 342 | 4.0 | 119 | 83 | 20 | 9 | 29.1 | 2.49 |
| Decatur | Georgia | 586 | 6.9 | 52 | 42 | 20 | 5 | 24.6 | 2.10 |
| Early | Georgia | 245 | 2.9 | 95 | 81 | 20 | 9 | 28.9 | 2.47 |
| Grady | Georgia | 512 | 6.0 | 55 | 32 | 20 | 4 | 23.5 | 2.01 |
| Lanier | Georgia | 173 | 2.0 | 101 | 85 | 20 | 9 | 29.4 | 2.51 |
| Lowndes | Georgia | 2057 | 24.1 | 101 | 79 | 20 | 9 | 28.7 | 2.45 |
| Miller | Georgia | 124 | 1.5 | 96 | 67 | 20 | 7 | 27.4 | 2.34 |
| Mitchell | Georgia | 523 | 6.1 | 94 | 63 | 20 | 7 | 26.9 | 2.30 |
| Seminole | Georgia | 186 | 2.2 | 96 | 67 | 20 | 7 | 27.4 | 2.34 |
| Thomas | Georgia | 881 | 10.3 | 55 | 41 | 20 | 5 | 24.5 | 2.09 |
| Worth | Georgia | 458 | 5.4 | 90 | 65 | 20 | 7 | 27.2 | 2.32 |
| Henry | Alabama | 125 | 1.5 | 115 | 112 | 20 | 12 | 32.3 | 2.76 |
| Houston | Alabama | 148 | 1.7 | 96 | 71 | 20 | 8 | 27.8 | 2.38 |
| Geneva | Alabama | 805 | 9.4 | 90 | 110 | 20 | 12 | 32.1 | 2.74 |

Table 4-11. Delivered cost of C&D wood waste for the TAL Hopkins facility (within a 2-hour travel time with competing demand)

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 72 | 0.8 | 9 | 4 | 20 | 0 | 20.4 | 1.75 |
| Franklin | Florida | 566 | 6.6 | 99 | 72 | 20 | 8 | 27.9 | 2.39 |
| Gadsden | Florida | 862 | 10.1 | 31 | 24 | 20 | 3 | 22.6 | 1.94 |
| Holmes | Florida | 95 | 1.1 | 66 | 91 | 20 | 10 | 30.0 | 2.56 |
| Jackson | Florida | 232 | 2.7 | 90 | 86 | 20 | 9 | 29.5 | 2.52 |
| Jefferson | Florida | 212 | 2.5 | 52 | 53 | 20 | 6 | 25.8 | 2.21 |
| Leon | Florida | 50237 | 587.8 | 23 | 11 | 20 | 1 | 21.2 | 1.81 |
| Liberty | Florida | 122 | 1.4 | 46 | 33 | 20 | 4 | 23.6 | 2.02 |
| Madison | Florida | 446 | 5.2 | 52 | 53 | 20 | 6 | 25.8 | 2.21 |
| Taylor | Florida | 175 | 2.0 | 73 | 71 | 20 | 8 | 27.8 | 2.38 |
| Wakulla | Florida | 484 | 5.7 | 33 | 24 | 20 | 3 | 22.6 | 1.94 |
| Walton | Florida | 18791 | 219.8 | 117 | 124 | 20 | 14 | 33.6 | 2.88 |
| Washington | Florida | 201 | 2.4 | 83 | 86 | 20 | 9 | 29.5 | 2.52 |
| Baker | Georgia | 86 | 1.0 | 97 | 75 | 20 | 8 | 28.3 | 2.41 |
| Brooks | Georgia | 333 | 3.9 | 83 | 67 | 20 | 7 | 27.4 | 2.34 |
| Colquitt | Georgia | 898 | 10.5 | 90 | 66 | 20 | 7 | 27.3 | 2.33 |
| Decatur | Georgia | 586 | 6.9 | 52 | 42 | 20 | 5 | 24.6 | 2.10 |
| Early | Georgia | 245 | 2.9 | 95 | 81 | 20 | 9 | 28.9 | 2.47 |
| Grady | Georgia | 512 | 6.0 | 55 | 32 | 20 | 4 | 23.5 | 2.01 |
| Miller | Georgia | 124 | 1.5 | 96 | 67 | 20 | 7 | 27.4 | 2.34 |
| Mitchell | Georgia | 523 | 6.1 | 94 | 63 | 20 | 7 | 26.9 | 2.30 |

| County | State | Wood waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Seminole | Georgia | 186 | 2.2 | 96 | 67 | 20 | 7 | 27.4 | 2.34 |
| Thomas | Georgia | 881 | 10.3 | 55 | 41 | 20 | 5 | 24.5 | 2.09 |
| Worth | Georgia | 458 | 5.4 | 90 | 65 | 20 | 7 | 27.2 | 2.32 |
| Henry | Alabama | 125 | 1.5 | 115 | 112 | 20 | 12 | 32.3 | 2.76 |
| Houston | Alabama | 148 | 1.7 | 96 | 71 | 20 | 8 | 27.8 | 2.38 |
| Geneva | Alabama | 805 | 9.4 | 90 | 110 | 20 | 12 | 32.1 | 2.74 |

For the C&D wood waste, the separation of treated wood from untreated wood would be a big challenge for any wood burning facility. Recent research studies have documented the evidence of inadvertent mixing of CCA-treated wood with untreated wood debris at these facilities while producing mulch from C&D wood or burning the wood as a boiler fuel. The sorting technologies that can be used for the segregation of treated wood from the wood waste stream are available and being investigated further. Several research projects were conducted by the research team of Dr. Solo-Gabriele (University of Miami) and Dr. Townsend (University of Florida). The relevant publications from the research results can be made available on request.

# 5. MUNICIPAL SOLID WASTE

## 5.1. Fuel Description

Municipal solid waste (MSW) is incinerated either as a mass burn or as refuse derived fuel (RDF). Though the style most often used has been mass burn, there are quite a few RDF plants in use. These facilities are distinguished from mass burn plants by the presence of waste pre-processing equipment. RDF is the name given both to the residual end product created by the processing and to the plant which burns the material. In RDF plants the truck usually dumps unprocessed MSW onto a conveyor which leads into a facility separate from the incinerator for preprocessing and sorting into resource streams. Though RDF plant designs differ according to the types of resources recovered and the degree of resource purity achieved in the end product, RDF is generally derived by removing noncombustible metals, glass and grit, and subsequently processing the remaining combustible waste to a uniform size. The RDF is a highly combustible and versatile feedstock containing mainly paper and plastic, which can be burned either as-is (a fluffy material) or in a dense, easily transported pelletized form. It can be burned either alone in a dedicated furnace/boiler attached to the processing facility (as most RDF plants are configured) or commingled with another fuel (e.g., sewage sludge, wood, coal) and shipped in pellet form off-site to another facility. For the calculations presented in this report, the fraction of waste that is reported to be combustible includes paper, plastics, textile, food waste and other organics.

Once the undesirable components of the waste stream have been removed, the waste is fed into the drying area adjacent to the furnace. The waste charging process is either done in batches (which usually causes combustion to be less stable because relatively cold outside air is introduced into the combustion chamber periodically), or continuously, by charging the waste down an inclined chute onto a moving grate. It is preferable to have the waste spread out evenly to maximize combustion, so grate systems are designed to have speed adjustments. The grate is sped up when highly combustible waste is fed, and slowed down when waste is wet or has a lower Btu value.

It is important to minimize the entry of hazardous, flammable, explosive, and toxic materials and other items not suitable for incineration. MSW incinerators should also be designed and operated to maximize the opportunity for inspection and screening out of undesirable wastes.

Two consequences of not removing unsuitable items include (1) explosions in the furnace of flammable/explosive materials and (2) contribution of concentrations of pollutant precursors, such as heavy metals (in batteries, appliances, and automotive parts), chlorine (in PVC and bleached paper), and organics (in solvents) resulting in higher emissions.

### 5.2. Current Management

In the region of this study, most of the MSW produced is landfilled. Several counties do have a system in place to take out some recyclables from the waste stream. In Florida, about 25% of the waste is recovered, 20% incinerated (with most of the incineration in South Florida) and a major portion of around 55% is landfilled (FDEP, 2005). In neighboring Georgia, landfill is the more predominant way of waste disposal with 74% of the waste produced in 2004 being disposed in lined MSW landfills (GDCA, 2005). In terms of the waste incinerators, two waste incinerators (in Lake County and Bay County, Florida) are within the present project boundary for Florida. The county with the only MSW incinerator in Georgia is not a part of the study.

It is important to recognize that in many counties in Florida, burning MSW is prohibited. Some examples of these counties include Alachua, Gilchrist, and Sumter. So, the possible example scenario for MSW use as a fuel source as per the objective of this study include the collection of MSW, the recovery of useable MSW, and the transportation to, for example, Alachua County (i.e., for the Deerhaven facility) for fuel. As evident from the list of waste components and their corresponding heat value as presented in Chapter 3, several components of MSW are ideal candidates for incineration as a form of disposal and for energy capture. A possible MSW management scenario could include: collection of MSW, recovery of the recyclables (economics of recycling is also a big factor), separation into combustible categories (those with high calorific values) and other components (e.g., readily biodegradable) and others. Energy can be gained by both combusting the high calorific substances and also operating a bioreactor landfill with readily biodegradable material to collect landfill gas, which can in turn be used for landfill gas to energy projects.

### 5.3. Waste Projection

For the MSW waste fuel projections in the area, the quantity of paper, plastic, textiles, food waste and other organics was calculated using the values reported by the various counties for MSW generation. The amount of MSW fuel produced at different counties within the study

region was projected using projected population data and rate of waste component production (Table 5-1).

Table 5-1. County level MSW (in tons) projections for the next 5 years.

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109,705 | 111,448 | 113,131 | 114,780 | 116,513 | 118,225 |
| Baker | Florida | 10,344 | 10,515 | 10,710 | 10,918 | 11,063 | 11,206 |
| Bay | Florida | 80,260 | 81,557 | 82,793 | 83,986 | 85,205 | 86,408 |
| Bradford | Florida | 10,562 | 10,682 | 10,790 | 10,898 | 11,007 | 11,114 |
| Calhoun | Florida | 3,806 | 3,848 | 3,877 | 3,906 | 3,948 | 3,994 |
| Citrus | Florida | 97,350 | 99,402 | 101,356 | 103,259 | 105,238 | 107,183 |
| Clay | Florida | 102,904 | 106,085 | 109,188 | 112,237 | 115,289 | 118,301 |
| Columbia | Florida | 39,711 | 40,603 | 41,534 | 42,457 | 43,185 | 43,890 |
| Dixie | Florida | 3,552 | 3,623 | 3,683 | 3,741 | 3,808 | 3,873 |
| Duval | Florida | 492,790 | 500,617 | 508,175 | 515,584 | 523,370 | 531,060 |
| Flagler | Florida | 52,501 | 55,212 | 57,507 | 59,573 | 62,372 | 65,143 |
| Franklin | Florida | 5,661 | 5,887 | 6,117 | 6,334 | 6,428 | 6,508 |
| Gadsden | Florida | 14,850 | 14,987 | 15,098 | 15,194 | 15,308 | 15,420 |
| Gilchrist | Florida | 4,838 | 4,978 | 5,123 | 5,270 | 5,395 | 5,517 |
| Gulf | Florida | 11,774 | 11,894 | 11,988 | 12,077 | 12,181 | 12,289 |
| Hamilton | Florida | 4,579 | 4,619 | 4,669 | 4,719 | 4,752 | 4,784 |
| Hernando | Florida | 84,291 | 86,235 | 88,005 | 89,674 | 91,626 | 93,557 |
| Holmes | Florida | 4,731 | 4,770 | 4,809 | 4,844 | 4,878 | 4,913 |
| Jackson | Florida | 24,387 | 24,728 | 25,045 | 25,336 | 25,566 | 25,772 |
| Jefferson | Florida | 7,817 | 7,897 | 7,976 | 8,049 | 8,120 | 8,193 |
| Lafayette | Florida | 1,741 | 1,756 | 1,754 | 1,746 | 1,765 | 1,783 |
| Lake | Florida | 101,584 | 105,149 | 108,616 | 112,015 | 115,450 | 118,841 |
| Leon | Florida | 152,504 | 155,134 | 157,559 | 159,852 | 162,602 | 165,325 |
| Levy | Florida | 16,252 | 16,638 | 17,044 | 17,457 | 17,798 | 18,138 |
| Liberty | Florida | 2,062 | 2,084 | 2,092 | 2,098 | 2,116 | 2,134 |
| Madison | Florida | 9,848 | 9,939 | 10,025 | 10,112 | 10,191 | 10,278 |
| Marion | Florida | 134,557 | 138,290 | 141,815 | 145,206 | 148,833 | 152,405 |
| Nassau | Florida | 24,041 | 24,722 | 25,461 | 26,230 | 26,840 | 27,438 |
| Orange | Florida | 749,975 | 771,103 | 792,249 | 813,258 | 833,233 | 852,909 |
| Pasco | Florida | 245,833 | 251,975 | 257,501 | 262,682 | 268,943 | 275,124 |
| Putnam | Florida | 26,959 | 27,187 | 27,433 | 27,669 | 27,885 | 28,108 |
| St. Johns | Florida | 93,323 | 96,919 | 100,370 | 103,731 | 107,225 | 110,686 |
| Sumter | Florida | 34,210 | 35,538 | 36,569 | 37,437 | 38,853 | 40,260 |
| Suwannee | Florida | 12,926 | 13,204 | 13,496 | 13,802 | 14,052 | 14,302 |
| Taylor | Florida | 4,591 | 4,664 | 4,734 | 4,803 | 4,876 | 4,948 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Union | Florida | 6,894 | 7,003 | 7,087 | 7,162 | 7,243 | 7,313 |
| Volusia | Florida | 339,167 | 345,812 | 352,379 | 358,846 | 365,157 | 371,358 |
| Wakulla | Florida | 7,383 | 7,709 | 8,017 | 8,308 | 8,540 | 8,754 |
| Walton | Florida | 46,180 | 46,914 | 47,622 | 48,316 | 49,046 | 49,766 |
| Washington | Florida | 9,395 | 9,666 | 9,927 | 10,173 | 10,343 | 10,496 |
| Baker | Georgia | 5,217 | 5,284 | 5,351 | 5,419 | 5,487 | 5,557 |
| Brantley | Georgia | 21,391 | 22,077 | 22,785 | 23,516 | 24,270 | 25,048 |
| Brooks | Georgia | 20,227 | 20,365 | 20,504 | 20,645 | 20,786 | 20,928 |
| Calhoun | Georgia | 8,872 | 9,104 | 9,341 | 9,584 | 9,834 | 10,091 |
| Camden | Georgia | 69,543 | 72,654 | 75,905 | 79,301 | 82,849 | 86,556 |
| Charlton | Georgia | 13,944 | 14,237 | 14,537 | 14,842 | 15,154 | 15,473 |
| Clinch | Georgia | 8,745 | 8,847 | 8,950 | 9,054 | 9,160 | 9,267 |
| Colquitt | Georgia | 54,626 | 55,433 | 56,251 | 57,081 | 57,923 | 58,778 |
| Cook | Georgia | 20,835 | 21,193 | 21,558 | 21,929 | 22,306 | 22,690 |
| Decatur | Georgia | 35,662 | 36,042 | 36,427 | 36,816 | 37,209 | 37,606 |
| Dougherty | Georgia | 112,838 | 112,868 | 112,899 | 112,929 | 112,960 | 112,990 |
| Early | Georgia | 14,917 | 14,980 | 15,043 | 15,106 | 15,170 | 15,234 |
| Echols | Georgia | 6,654 | 7,059 | 7,489 | 7,944 | 8,428 | 8,940 |
| Glynn | Georgia | 83,827 | 84,507 | 85,193 | 85,884 | 86,581 | 87,284 |
| Grady | Georgia | 31,140 | 31,659 | 32,187 | 32,723 | 33,268 | 33,823 |
| Lanier | Georgia | 10,506 | 10,831 | 11,166 | 11,511 | 11,867 | 12,233 |
| Lowndes | Georgia | 125,105 | 127,762 | 130,475 | 133,245 | 136,075 | 138,964 |
| McIntosh | Georgia | 15,182 | 15,571 | 15,970 | 16,379 | 16,799 | 17,230 |
| Miller | Georgia | 7,570 | 7,582 | 7,594 | 7,607 | 7,619 | 7,632 |
| Mitchell | Georgia | 31,797 | 32,371 | 32,955 | 33,549 | 34,154 | 34,770 |
| Pierce | Georgia | 20,672 | 21,030 | 21,394 | 21,765 | 22,142 | 22,525 |
| Seminole | Georgia | 11,294 | 11,339 | 11,384 | 11,430 | 11,475 | 11,521 |
| Thomas | Georgia | 53,622 | 54,145 | 54,672 | 55,205 | 55,743 | 56,286 |
| Ware | Georgia | 41,609 | 41,611 | 41,612 | 41,614 | 41,615 | 41,616 |
| Wayne | Georgia | 35,488 | 36,156 | 36,837 | 37,530 | 38,237 | 38,957 |
| Worth | Georgia | 27,853 | 28,167 | 28,484 | 28,805 | 29,129 | 29,457 |
| Henry | Alabama | 7,620 | 7,718 | 7,815 | 7,915 | 8,016 | 8,117 |
| Houston | Alabama | 8,996 | 9,111 | 9,226 | 9,344 | 9,463 | 9,582 |
| Geneva | Alabama | 48,971 | 49,046 | 49,667 | 50,270 | 50,940 | 51,582 |

Table 5-2 presents the value of the MSW fuel projection in potential Btu of energy if all MSW components produced are used as fuel. A value of 5,000 Btu/lb was used for the energy conversion.

Table 5-2. County level MSW projections (in billion Btu) for the next 5 years.

| **County** | **State** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 1,097 | 1,114 | 1,131 | 1,148 | 1,165 | 1,182 |
| Baker | Florida | 103 | 105 | 107 | 109 | 111 | 112 |
| Bay | Florida | 803 | 816 | 828 | 840 | 852 | 864 |
| Bradford | Florida | 106 | 107 | 108 | 109 | 110 | 111 |
| Calhoun | Florida | 38 | 38 | 39 | 39 | 39 | 40 |
| Citrus | Florida | 974 | 994 | 1,014 | 1,033 | 1,052 | 1,072 |
| Clay | Florida | 1,029 | 1,061 | 1,092 | 1,122 | 1,153 | 1,183 |
| Columbia | Florida | 397 | 406 | 415 | 425 | 432 | 439 |
| Dixie | Florida | 36 | 36 | 37 | 37 | 38 | 39 |
| Duval | Florida | 4,928 | 5,006 | 5,082 | 5,156 | 5,234 | 5,311 |
| Flagler | Florida | 525 | 552 | 575 | 596 | 624 | 651 |
| Franklin | Florida | 57 | 59 | 61 | 63 | 64 | 65 |
| Gadsden | Florida | 149 | 150 | 151 | 152 | 153 | 154 |
| Gilchrist | Florida | 48 | 50 | 51 | 53 | 54 | 55 |
| Gulf | Florida | 118 | 119 | 120 | 121 | 122 | 123 |
| Hamilton | Florida | 46 | 46 | 47 | 47 | 48 | 48 |
| Hernando | Florida | 843 | 862 | 880 | 897 | 916 | 936 |
| Holmes | Florida | 47 | 48 | 48 | 48 | 49 | 49 |
| Jackson | Florida | 244 | 247 | 250 | 253 | 256 | 258 |
| Jefferson | Florida | 78 | 79 | 80 | 80 | 81 | 82 |
| Lafayette | Florida | 17 | 18 | 18 | 17 | 18 | 18 |
| Lake | Florida | 1,016 | 1,051 | 1,086 | 1,120 | 1,155 | 1,188 |
| Leon | Florida | 1,525 | 1,551 | 1,576 | 1,599 | 1,626 | 1,653 |
| Levy | Florida | 163 | 166 | 170 | 175 | 178 | 181 |
| Liberty | Florida | 21 | 21 | 21 | 21 | 21 | 21 |
| Madison | Florida | 98 | 99 | 100 | 101 | 102 | 103 |
| Marion | Florida | 1,346 | 1,383 | 1,418 | 1,452 | 1,488 | 1,524 |
| Nassau | Florida | 240 | 247 | 255 | 262 | 268 | 274 |
| Orange | Florida | 7,500 | 7,711 | 7,922 | 8,133 | 8,332 | 8,529 |
| Pasco | Florida | 2,458 | 2,520 | 2,575 | 2,627 | 2,689 | 2,751 |
| Putnam | Florida | 270 | 272 | 274 | 277 | 279 | 281 |
| St. Johns | Florida | 933 | 969 | 1,004 | 1,037 | 1,072 | 1,107 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Sumter | Florida | 342 | 355 | 366 | 374 | 389 | 403 |
| Suwannee | Florida | 129 | 132 | 135 | 138 | 141 | 143 |
| Taylor | Florida | 46 | 47 | 47 | 48 | 49 | 49 |
| Union | Florida | 69 | 70 | 71 | 72 | 72 | 73 |
| Volusia | Florida | 3,392 | 3,458 | 3,524 | 3,588 | 3,652 | 3,714 |
| Wakulla | Florida | 74 | 77 | 80 | 83 | 85 | 88 |
| Walton | Florida | 462 | 469 | 476 | 483 | 490 | 498 |
| Washington | Florida | 94 | 97 | 99 | 102 | 103 | 105 |
| Baker | Georgia | 52 | 53 | 54 | 54 | 55 | 56 |
| Brantley | Georgia | 214 | 221 | 228 | 235 | 243 | 250 |
| Brooks | Georgia | 202 | 204 | 205 | 206 | 208 | 209 |
| Calhoun | Georgia | 89 | 91 | 93 | 96 | 98 | 101 |
| Camden | Georgia | 695 | 727 | 759 | 793 | 828 | 866 |
| Charlton | Georgia | 139 | 142 | 145 | 148 | 152 | 155 |
| Clinch | Georgia | 87 | 88 | 90 | 91 | 92 | 93 |
| Colquitt | Georgia | 546 | 554 | 563 | 571 | 579 | 588 |
| Cook | Georgia | 208 | 212 | 216 | 219 | 223 | 227 |
| Decatur | Georgia | 357 | 360 | 364 | 368 | 372 | 376 |
| Dougherty | Georgia | 1,128 | 1,129 | 1,129 | 1,129 | 1,130 | 1,130 |
| Early | Georgia | 149 | 150 | 150 | 151 | 152 | 152 |
| Echols | Georgia | 67 | 71 | 75 | 79 | 84 | 89 |
| Glynn | Georgia | 838 | 845 | 852 | 859 | 866 | 873 |
| Grady | Georgia | 311 | 317 | 322 | 327 | 333 | 338 |
| Lanier | Georgia | 105 | 108 | 112 | 115 | 119 | 122 |
| Lowndes | Georgia | 1,251 | 1,278 | 1,305 | 1,332 | 1,361 | 1,390 |
| McIntosh | Georgia | 152 | 156 | 160 | 164 | 168 | 172 |
| Miller | Georgia | 76 | 76 | 76 | 76 | 76 | 76 |
| Mitchell | Georgia | 318 | 324 | 330 | 335 | 342 | 348 |
| Pierce | Georgia | 207 | 210 | 214 | 218 | 221 | 225 |
| Seminole | Georgia | 113 | 113 | 114 | 114 | 115 | 115 |
| Thomas | Georgia | 536 | 541 | 547 | 552 | 557 | 563 |
| Ware | Georgia | 416 | 416 | 416 | 416 | 416 | 416 |
| Wayne | Georgia | 355 | 362 | 368 | 375 | 382 | 390 |
| Worth | Georgia | 279 | 282 | 285 | 288 | 291 | 295 |
| Henry | Alabama | 76 | 77 | 78 | 79 | 80 | 81 |
| Houston | Alabama | 90 | 91 | 92 | 93 | 95 | 96 |
| Geneva | Alabama | 490 | 490 | 497 | 503 | 509 | 516 |

## 5.4. Feasibility Assessment

From the projected energy values from the MSW fuel in various counties (Table 5-2), a region specific calculation for the three facilities was completed. Within a specific region in most cases, MSW is collected at either the local transfer station or the active landfill sites. In some counties, the waste goes out of the county for disposal. The processing cost of MSW for fuel applications is approximately $40/ton. The transportation cost was calculated based on the distance from the MSW disposal facility in the region and the corresponding nearest power plant facility. Tables 5-3 thru 5-5 present the delivered cost per MMBtu for the MSW waste from the different counties to the three power generation units targeted in this study. The scenario of all the waste from a specific county being available for all the three facilities is being presented (without competing demand between facilities). The data calculation has been shown only for the year 2007. Similar calculations can be performed for other years. The major part of total cost is the processing of waste before its use as fuel. As mentioned before in this document, the income from tipping fee has not been included in this calculation. The other two scenarios for the three facilities one considering two hour travel time from the waste collection center to the power plant (with no competing demand) and the other considering the 2-hour travel time with competing demand (and assuming that the waste goes to the nearest facility in case of two or more facilities being within a travel time range of 2-hour is presented for the three facilities in Table 5-6 thru 5-11.

Table 5-3. Delivered cost for MSW used as a fuel source for the GRU Deerhaven facility.

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109705 | 1097 | 18 | 9.2 | 40 | 1 | 41.0 | 4.10 |
| Baker | Florida | 10344 | 103 | 67 | 55 | 40 | 6 | 46.1 | 4.61 |
| Bay | Florida | 80260 | 803 | 266 | 266 | 40 | 29 | 69.3 | 6.93 |
| Bradford | Florida | 10562 | 106 | 51 | 37 | 40 | 4 | 44.1 | 4.41 |
| Calhoun | Florida | 3806 | 38 | 174 | 149 | 40 | 16 | 56.4 | 5.64 |
| Citrus | Florida | 97350 | 974 | 95 | 79 | 40 | 9 | 48.7 | 4.87 |
| Clay | Florida | 102904 | 1029 | 78 | 60 | 40 | 7 | 46.6 | 4.66 |
| Columbia | Florida | 39711 | 397 | 52 | 51 | 40 | 6 | 45.6 | 4.56 |
| Dixie | Florida | 3552 | 36 | 52 | 44 | 40 | 5 | 44.8 | 4.48 |
| Duval | Florida | 492790 | 4928 | 76 | 63 | 40 | 7 | 46.9 | 4.69 |
| Flagler | Florida | 52501 | 525 | 123 | 81 | 40 | 9 | 48.9 | 4.89 |
| Franklin | Florida | 5661 | 57 | 222 | 208 | 40 | 23 | 62.9 | 6.29 |
| Gadsden | Florida | 14850 | 149 | 152 | 167 | 40 | 18 | 58.4 | 5.84 |
| Gilchrist | Florida | 4838 | 48 | 49 | 35 | 40 | 4 | 43.9 | 4.39 |
| Gulf | Florida | 11774 | 118 | 255 | 243 | 40 | 27 | 66.7 | 6.67 |
| Hamilton | Florida | 4579 | 46 | 68 | 67 | 40 | 7 | 47.4 | 4.74 |
| Hernando | Florida | 84291 | 843 | 119 | 109 | 40 | 12 | 52.0 | 5.20 |
| Holmes | Florida | 4731 | 47 | 208 | 234 | 40 | 26 | 65.7 | 6.57 |
| Jackson | Florida | 24387 | 244 | 209 | 225 | 40 | 25 | 64.8 | 6.48 |
| Jefferson | Florida | 7817 | 78 | 95 | 105 | 40 | 12 | 51.6 | 5.16 |
| Lafayette | Florida | 1741 | 17 | 83 | 60 | 40 | 7 | 46.6 | 4.66 |
| Lake | Florida | 101584 | 1016 | 99 | 99 | 40 | 11 | 50.9 | 5.09 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Leon | Florida | 152504 | 1525 | 129 | 135 | 40 | 15 | 54.9 | 5.49 |
| Levy | Florida | 16252 | 163 | 69 | 48 | 40 | 5 | 45.3 | 4.53 |
| Liberty | Florida | 2062 | 21 | 173 | 185 | 40 | 20 | 60.4 | 6.04 |
| Madison | Florida | 9848 | 98 | 95 | 105 | 40 | 12 | 51.6 | 5.16 |
| Marion | Florida | 134557 | 1346 | 68 | 58 | 40 | 6 | 46.4 | 4.64 |
| Nassau | Florida | 24041 | 240 | 103 | 79 | 40 | 9 | 48.7 | 4.87 |
| Orange | Florida | 749975 | 7500 | 134 | 137 | 40 | 15 | 55.1 | 5.51 |
| Pasco | Florida | 245833 | 2458 | 145 | 139 | 40 | 15 | 55.3 | 5.53 |
| Putnam | Florida | 26959 | 270 | 72 | 56 | 40 | 6 | 46.2 | 4.62 |
| St. Johns | Florida | 93323 | 933 | 112 | 85 | 40 | 9 | 49.4 | 4.94 |
| Sumter | Florida | 34210 | 342 | 79 | 80 | 40 | 9 | 48.8 | 4.88 |
| Suwannee | Florida | 12926 | 129 | 63 | 66 | 40 | 7 | 47.3 | 4.73 |
| Taylor | Florida | 4591 | 46 | 105 | 93 | 40 | 10 | 50.2 | 5.02 |
| Union | Florida | 6894 | 69 | 62 | 47 | 40 | 5 | 45.2 | 4.52 |
| Volusia | Florida | 339167 | 3392 | 120 | 111 | 40 | 12 | 52.2 | 5.22 |
| Wakulla | Florida | 7383 | 74 | 160 | 164 | 40 | 18 | 58.0 | 5.80 |
| Walton | Florida | 46180 | 462 | 240 | 267 | 40 | 29 | 69.4 | 6.94 |
| Washington | Florida | 9395 | 94 | 205 | 229 | 40 | 25 | 65.2 | 6.52 |
| Baker | Georgia | 5217 | 52 | 187 | 185 | 40 | 20 | 60.4 | 6.04 |
| Brantley | Georgia | 21391 | 214 | 163 | 119 | 40 | 13 | 53.1 | 5.31 |
| Brooks | Georgia | 20227 | 202 | 109 | 116 | 40 | 13 | 52.8 | 5.28 |
| Calhoun | Georgia | 8872 | 89 | 228 | 214 | 40 | 24 | 63.5 | 6.35 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Camden | Georgia | 69543 | 695 | 135 | 116 | 40 | 13 | 52.8 | 5.28 |
| Charlton | Georgia | 13944 | 139 | 131 | 97 | 40 | 11 | 50.7 | 5.07 |
| Clinch | Georgia | 8745 | 87 | 133 | 135 | 40 | 15 | 54.9 | 5.49 |
| Colquitt | Georgia | 54626 | 546 | 150 | 141 | 40 | 16 | 55.5 | 5.55 |
| Cook | Georgia | 20835 | 208 | 112 | 121 | 40 | 13 | 53.3 | 5.33 |
| Decatur | Georgia | 35662 | 357 | 174 | 185 | 40 | 20 | 60.4 | 6.04 |
| Dougherty | Georgia | 112838 | 1128 | 178 | 178 | 40 | 20 | 59.6 | 5.96 |
| Early | Georgia | 14917 | 149 | 227 | 224 | 40 | 25 | 64.6 | 6.46 |
| Echols | Georgia | 6654 | 67 | 100 | 90 | 40 | 10 | 49.9 | 4.99 |
| Glynn | Georgia | 83827 | 838 | 153 | 145 | 40 | 16 | 56.0 | 5.60 |
| Grady | Georgia | 31140 | 311 | 172 | 170 | 40 | 19 | 58.7 | 5.87 |
| Lanier | Georgia | 10506 | 105 | 91 | 99 | 40 | 11 | 50.9 | 5.09 |
| Lowndes | Georgia | 125105 | 1251 | 96 | 100 | 40 | 11 | 51.0 | 5.10 |
| McIntosh | Georgia | 15182 | 152 | 175 | 164 | 40 | 18 | 58.0 | 5.80 |
| Miller | Georgia | 7570 | 76 | 212 | 203 | 40 | 22 | 62.3 | 6.23 |
| Mitchell | Georgia | 31797 | 318 | 173 | 164 | 40 | 18 | 58.0 | 5.80 |
| Pierce | Georgia | 20672 | 207 | 174 | 147 | 40 | 16 | 56.2 | 5.62 |
| Seminole | Georgia | 11294 | 113 | 212 | 203 | 40 | 22 | 62.3 | 6.23 |
| Thomas | Georgia | 53622 | 536 | 140 | 138 | 40 | 15 | 55.2 | 5.52 |
| Ware | Georgia | 41609 | 416 | 131 | 97 | 40 | 11 | 50.7 | 5.07 |
| Wayne | Georgia | 35488 | 355 | 191 | 142 | 40 | 16 | 55.6 | 5.56 |
| Worth | Georgia | 27853 | 279 | 150 | 141 | 40 | 16 | 55.5 | 5.55 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Henry | Alabama | 7620 | 76 | 270 | 273 | 40 | 30 | 70.0 | 7.00 |
| Houston | Alabama | 8996 | 90 | 212 | 203 | 40 | 22 | 62.3 | 6.23 |
| Geneva | Alabama | 48971 | 490 | 230 | 254 | 40 | 28 | 67.9 | 6.79 |

Table 5-4. Delivered cost for MSW used as a fuel source for the JEA Brandy Branch facility.

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109705 | 1097 | 69 | 53.5 | 40 | 6 | 45.9 | 4.59 |
| Baker | Florida | 10344 | 103 | 23 | 23 | 40 | 3 | 42.5 | 4.25 |
| Bay | Florida | 80260 | 803 | 272 | 272 | 40 | 30 | 69.9 | 6.99 |
| Bradford | Florida | 10562 | 106 | 36 | 32 | 40 | 4 | 43.5 | 4.35 |
| Calhoun | Florida | 3806 | 38 | 167 | 154 | 40 | 17 | 56.9 | 5.69 |
| Citrus | Florida | 97350 | 974 | 150 | 122 | 40 | 13 | 53.4 | 5.34 |
| Clay | Florida | 102904 | 1029 | 50 | 44 | 40 | 5 | 44.8 | 4.48 |
| Columbia | Florida | 39711 | 397 | 50 | 48 | 40 | 5 | 45.3 | 4.53 |
| Dixie | Florida | 3552 | 36 | 127 | 109 | 40 | 12 | 52.0 | 5.20 |
| Duval | Florida | 492790 | 4928 | 8 | 8 | 40 | 1 | 40.9 | 4.09 |
| Flagler | Florida | 52501 | 525 | 96 | 87 | 40 | 10 | 49.6 | 4.96 |
| Franklin | Florida | 5661 | 57 | 228 | 214 | 40 | 24 | 63.5 | 6.35 |
| Gadsden | Florida | 14850 | 149 | 155 | 171 | 40 | 19 | 58.8 | 5.88 |
| Gilchrist | Florida | 4838 | 48 | 100 | 100 | 40 | 11 | 51.0 | 5.10 |
| Gulf | Florida | 11774 | 118 | 261 | 249 | 40 | 27 | 67.4 | 6.74 |
| Hamilton | Florida | 4579 | 46 | 76 | 73 | 40 | 8 | 48.0 | 4.80 |
| Hernando | Florida | 84291 | 843 | 175 | 152 | 40 | 17 | 56.7 | 5.67 |
| Holmes | Florida | 4731 | 47 | 210 | 239 | 40 | 26 | 66.3 | 6.63 |
| Jackson | Florida | 24387 | 244 | 215 | 232 | 40 | 26 | 65.5 | 6.55 |
| Jefferson | Florida | 7817 | 78 | 98 | 110 | 40 | 12 | 52.1 | 5.21 |
| Lafayette | Florida | 1741 | 17 | 105 | 96 | 40 | 11 | 50.6 | 5.06 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 101584 | 1016 | 165 | 142 | 40 | 16 | 55.6 | 5.56 |
| Leon | Florida | 152504 | 1525 | 135 | 141 | 40 | 16 | 55.5 | 5.55 |
| Levy | Florida | 16252 | 163 | 128 | 93 | 40 | 10 | 50.2 | 5.02 |
| Liberty | Florida | 2062 | 21 | 176 | 190 | 40 | 21 | 60.9 | 6.09 |
| Madison | Florida | 9848 | 98 | 98 | 110 | 40 | 12 | 52.1 | 5.21 |
| Marion | Florida | 134557 | 1346 | 117 | 92 | 40 | 10 | 50.1 | 5.01 |
| Nassau | Florida | 24041 | 240 | 33 | 25 | 40 | 3 | 42.8 | 4.28 |
| Orange | Florida | 749975 | 7500 | 161 | 167 | 40 | 18 | 58.4 | 5.84 |
| Pasco | Florida | 245833 | 2458 | 200 | 182 | 40 | 20 | 60.0 | 6.00 |
| Putnam | Florida | 26959 | 270 | 85 | 67 | 40 | 7 | 47.4 | 4.74 |
| St. Johns | Florida | 93323 | 933 | 67 | 65 | 40 | 7 | 47.2 | 4.72 |
| Sumter | Florida | 34210 | 342 | 134 | 123 | 40 | 14 | 53.5 | 5.35 |
| Suwannee | Florida | 12926 | 129 | 66 | 71 | 40 | 8 | 47.8 | 4.78 |
| Taylor | Florida | 4591 | 46 | 134 | 135 | 40 | 15 | 54.9 | 5.49 |
| Union | Florida | 6894 | 69 | 34 | 28 | 40 | 3 | 43.1 | 4.31 |
| Volusia | Florida | 339167 | 3392 | 101 | 112 | 40 | 12 | 52.3 | 5.23 |
| Wakulla | Florida | 7383 | 74 | 182 | 170 | 40 | 19 | 58.7 | 5.87 |
| Walton | Florida | 46180 | 462 | 240 | 272 | 40 | 30 | 69.9 | 6.99 |
| Washington | Florida | 9395 | 94 | 207 | 234 | 40 | 26 | 65.7 | 6.57 |
| Baker | Georgia | 5217 | 52 | 190 | 190 | 40 | 21 | 60.9 | 6.09 |
| Brantley | Georgia | 21391 | 214 | 94 | 71 | 40 | 8 | 47.8 | 4.78 |
| Brooks | Georgia | 20227 | 202 | 112 | 120 | 40 | 13 | 53.2 | 5.32 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 8872 | 89 | 234 | 220 | 40 | 24 | 64.2 | 6.42 |
| Camden | Georgia | 69543 | 695 | 70 | 60 | 40 | 7 | 46.6 | 4.66 |
| Charlton | Georgia | 13944 | 139 | 69 | 50 | 40 | 6 | 45.5 | 4.55 |
| Clinch | Georgia | 8745 | 87 | 113 | 88 | 40 | 10 | 49.7 | 4.97 |
| Colquitt | Georgia | 54626 | 546 | 155 | 147 | 40 | 16 | 56.2 | 5.62 |
| Cook | Georgia | 20835 | 208 | 118 | 127 | 40 | 14 | 54.0 | 5.40 |
| Decatur | Georgia | 35662 | 357 | 177 | 190 | 40 | 21 | 60.9 | 6.09 |
| Dougherty | Georgia | 112838 | 1128 | 185 | 185 | 40 | 20 | 60.4 | 6.04 |
| Early | Georgia | 14917 | 149 | 229 | 229 | 40 | 25 | 65.2 | 6.52 |
| Echols | Georgia | 6654 | 67 | 93 | 78 | 40 | 9 | 48.6 | 4.86 |
| Glynn | Georgia | 83827 | 838 | 86 | 91 | 40 | 10 | 50.0 | 5.00 |
| Grady | Georgia | 31140 | 311 | 178 | 177 | 40 | 19 | 59.5 | 5.95 |
| Lanier | Georgia | 10506 | 105 | 94 | 104 | 40 | 11 | 51.4 | 5.14 |
| Lowndes | Georgia | 125105 | 1251 | 102 | 106 | 40 | 12 | 51.7 | 5.17 |
| McIntosh | Georgia | 15182 | 152 | 109 | 108 | 40 | 12 | 51.9 | 5.19 |
| Miller | Georgia | 7570 | 76 | 218 | 209 | 40 | 23 | 63.0 | 6.30 |
| Mitchell | Georgia | 31797 | 318 | 180 | 171 | 40 | 19 | 58.8 | 5.88 |
| Pierce | Georgia | 20672 | 207 | 107 | 92 | 40 | 10 | 50.1 | 5.01 |
| Seminole | Georgia | 11294 | 113 | 218 | 209 | 40 | 23 | 63.0 | 6.30 |
| Thomas | Georgia | 53622 | 536 | 147 | 144 | 40 | 16 | 55.8 | 5.58 |
| Ware | Georgia | 41609 | 416 | 69 | 50 | 40 | 6 | 45.5 | 4.55 |
| Wayne | Georgia | 35488 | 355 | 121 | 93 | 40 | 10 | 50.2 | 5.02 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 27853 | 279 | 155 | 147 | 40 | 16 | 56.2 | 5.62 |
| Henry | Alabama | 7620 | 76 | 265 | 254 | 40 | 28 | 67.9 | 6.79 |
| Houston | Alabama | 8996 | 90 | 218 | 209 | 40 | 23 | 63.0 | 6.30 |
| Geneva | Alabama | 48971 | 490 | 240 | 261 | 40 | 29 | 68.7 | 6.87 |

Table 5-5. Delivered cost for MSW used as a fuel source for the TAL Hopkins facility.

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109705 | 1097 | 154 | 159 | 40 | 17 | 57.5 | 5.75 |
| Baker | Florida | 10344 | 103 | 122 | 135 | 40 | 15 | 54.9 | 5.49 |
| Bay | Florida | 80260 | 803 | 147 | 126 | 40 | 14 | 53.9 | 5.39 |
| Bradford | Florida | 10562 | 106 | 161 | 164 | 40 | 18 | 58.0 | 5.80 |
| Calhoun | Florida | 3806 | 38 | 9 | 4 | 40 | 0 | 40.4 | 4.04 |
| Citrus | Florida | 97350 | 974 | 218 | 221 | 40 | 24 | 64.3 | 6.43 |
| Clay | Florida | 102904 | 1029 | 181 | 192 | 40 | 21 | 61.1 | 6.11 |
| Columbia | Florida | 39711 | 397 | 108 | 112 | 40 | 12 | 52.3 | 5.23 |
| Dixie | Florida | 3552 | 36 | 118 | 114 | 40 | 13 | 52.5 | 5.25 |
| Duval | Florida | 492790 | 4928 | 140 | 157 | 40 | 17 | 57.3 | 5.73 |
| Flagler | Florida | 52501 | 525 | 230 | 239 | 40 | 26 | 66.3 | 6.63 |
| Franklin | Florida | 5661 | 57 | 99 | 72 | 40 | 8 | 47.9 | 4.79 |
| Gadsden | Florida | 14850 | 149 | 31 | 24 | 40 | 3 | 42.6 | 4.26 |
| Gilchrist | Florida | 4838 | 48 | 148 | 151 | 40 | 17 | 56.6 | 5.66 |
| Gulf | Florida | 11774 | 118 | 136 | 97 | 40 | 11 | 50.7 | 5.07 |
| Hamilton | Florida | 4579 | 46 | 110 | 106 | 40 | 12 | 51.7 | 5.17 |
| Hernando | Florida | 84291 | 843 | 231 | 187 | 40 | 21 | 60.6 | 6.06 |
| Holmes | Florida | 4731 | 47 | 66 | 91 | 40 | 10 | 50.0 | 5.00 |
| Jackson | Florida | 24387 | 244 | 90 | 86 | 40 | 9 | 49.5 | 4.95 |
| Jefferson | Florida | 7817 | 78 | 52 | 53 | 40 | 6 | 45.8 | 4.58 |
| Lafayette | Florida | 1741 | 17 | 111 | 102 | 40 | 11 | 51.2 | 5.12 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 101584 | 1016 | 233 | 241 | 40 | 27 | 66.5 | 6.65 |
| Leon | Florida | 152504 | 1525 | 23 | 11 | 40 | 1 | 41.2 | 4.12 |
| Levy | Florida | 16252 | 163 | 170 | 137 | 40 | 15 | 55.1 | 5.51 |
| Liberty | Florida | 2062 | 21 | 46 | 33 | 40 | 4 | 43.6 | 4.36 |
| Madison | Florida | 9848 | 98 | 52 | 53 | 40 | 6 | 45.8 | 4.58 |
| Marion | Florida | 134557 | 1346 | 192 | 200 | 40 | 22 | 62.0 | 6.20 |
| Nassau | Florida | 24041 | 240 | 155 | 178 | 40 | 20 | 59.6 | 5.96 |
| Orange | Florida | 749975 | 7500 | 257 | 279 | 40 | 31 | 70.7 | 7.07 |
| Pasco | Florida | 245833 | 2458 | 268 | 281 | 40 | 31 | 70.9 | 7.09 |
| Putnam | Florida | 26959 | 270 | 204 | 206 | 40 | 23 | 62.7 | 6.27 |
| St. Johns | Florida | 93323 | 933 | 198 | 213 | 40 | 23 | 63.4 | 6.34 |
| Sumter | Florida | 34210 | 342 | 202 | 222 | 40 | 24 | 64.4 | 6.44 |
| Suwannee | Florida | 12926 | 129 | 91 | 97 | 40 | 11 | 50.7 | 5.07 |
| Taylor | Florida | 4591 | 46 | 73 | 71 | 40 | 8 | 47.8 | 4.78 |
| Union | Florida | 6894 | 69 | 145 | 153 | 40 | 17 | 56.8 | 5.68 |
| Volusia | Florida | 339167 | 3392 | 232 | 260 | 40 | 29 | 68.6 | 6.86 |
| Wakulla | Florida | 7383 | 74 | 33 | 24 | 40 | 3 | 42.6 | 4.26 |
| Walton | Florida | 46180 | 462 | 117 | 124 | 40 | 14 | 53.6 | 5.36 |
| Washington | Florida | 9395 | 94 | 83 | 86 | 40 | 9 | 49.5 | 4.95 |
| Baker | Georgia | 5217 | 52 | 97 | 75 | 40 | 8 | 48.3 | 4.83 |
| Brantley | Georgia | 21391 | 214 | 231 | 215 | 40 | 24 | 63.7 | 6.37 |
| Brooks | Georgia | 20227 | 202 | 83 | 67 | 40 | 7 | 47.4 | 4.74 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 8872 | 89 | 130 | 92 | 40 | 10 | 50.1 | 5.01 |
| Camden | Georgia | 69543 | 695 | 208 | 214 | 40 | 24 | 63.5 | 6.35 |
| Charlton | Georgia | 13944 | 139 | 200 | 192 | 40 | 21 | 61.1 | 6.11 |
| Clinch | Georgia | 8745 | 87 | 142 | 121 | 40 | 13 | 53.3 | 5.33 |
| Colquitt | Georgia | 54626 | 546 | 90 | 66 | 40 | 7 | 47.3 | 4.73 |
| Cook | Georgia | 20835 | 208 | 119 | 83 | 40 | 9 | 49.1 | 4.91 |
| Decatur | Georgia | 35662 | 357 | 52 | 42 | 40 | 5 | 44.6 | 4.46 |
| Dougherty | Georgia | 112838 | 1128 | 133 | 92 | 40 | 10 | 50.1 | 5.01 |
| Early | Georgia | 14917 | 149 | 95 | 81 | 40 | 9 | 48.9 | 4.89 |
| Echols | Georgia | 6654 | 67 | 130 | 114 | 40 | 13 | 52.5 | 5.25 |
| Glynn | Georgia | 83827 | 838 | 217 | 239 | 40 | 26 | 66.3 | 6.63 |
| Grady | Georgia | 31140 | 311 | 55 | 32 | 40 | 4 | 43.5 | 4.35 |
| Lanier | Georgia | 10506 | 105 | 101 | 85 | 40 | 9 | 49.4 | 4.94 |
| Lowndes | Georgia | 125105 | 1251 | 101 | 79 | 40 | 9 | 48.7 | 4.87 |
| McIntosh | Georgia | 15182 | 152 | 247 | 263 | 40 | 29 | 68.9 | 6.89 |
| Miller | Georgia | 7570 | 76 | 96 | 67 | 40 | 7 | 47.4 | 4.74 |
| Mitchell | Georgia | 31797 | 318 | 94 | 63 | 40 | 7 | 46.9 | 4.69 |
| Pierce | Georgia | 20672 | 207 | 189 | 155 | 40 | 17 | 57.1 | 5.71 |
| Seminole | Georgia | 11294 | 113 | 96 | 67 | 40 | 7 | 47.4 | 4.74 |
| Thomas | Georgia | 53622 | 536 | 55 | 41 | 40 | 5 | 44.5 | 4.45 |
| Ware | Georgia | 41609 | 416 | 199 | 192 | 40 | 21 | 61.1 | 6.11 |
| Wayne | Georgia | 35488 | 355 | 241 | 186 | 40 | 20 | 60.5 | 6.05 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 27853 | 279 | 90 | 65 | 40 | 7 | 47.2 | 4.72 |
| Henry | Alabama | 7620 | 76 | 115 | 112 | 40 | 12 | 52.3 | 5.23 |
| Houston | Alabama | 8996 | 90 | 96 | 71 | 40 | 8 | 47.8 | 4.78 |
| Geneva | Alabama | 48971 | 490 | 90 | 110 | 40 | 12 | 52.1 | 5.21 |

Table 5-6. Delivered cost for MSW used as a fuel source for the GRU Deerhaven facility (within a 2-hour travel time)

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109705 | 1097 | 18 | 9.2 | 40 | 1 | 41.0 | 4.10 |
| Baker | Florida | 10344 | 103 | 67 | 55 | 40 | 6 | 46.1 | 4.61 |
| Bradford | Florida | 10562 | 106 | 51 | 37 | 40 | 4 | 44.1 | 4.41 |
| Citrus | Florida | 97350 | 974 | 95 | 79 | 40 | 9 | 48.7 | 4.87 |
| Clay | Florida | 102904 | 1029 | 78 | 60 | 40 | 7 | 46.6 | 4.66 |
| Columbia | Florida | 39711 | 397 | 52 | 51 | 40 | 6 | 45.6 | 4.56 |
| Dixie | Florida | 3552 | 36 | 52 | 44 | 40 | 5 | 44.8 | 4.48 |
| Duval | Florida | 492790 | 4928 | 76 | 63 | 40 | 7 | 46.9 | 4.69 |
| Gilchrist | Florida | 4838 | 48 | 49 | 35 | 40 | 4 | 43.9 | 4.39 |
| Hamilton | Florida | 4579 | 46 | 68 | 67 | 40 | 7 | 47.4 | 4.74 |
| Hernando | Florida | 84291 | 843 | 119 | 109 | 40 | 12 | 52.0 | 5.20 |
| Jefferson | Florida | 7817 | 78 | 95 | 105 | 40 | 12 | 51.6 | 5.16 |
| Lafayette | Florida | 1741 | 17 | 83 | 60 | 40 | 7 | 46.6 | 4.66 |
| Lake | Florida | 101584 | 1016 | 99 | 99 | 40 | 11 | 50.9 | 5.09 |
| Madison | Florida | 9848 | 98 | 95 | 105 | 40 | 12 | 51.6 | 5.16 |
| Marion | Florida | 134557 | 1346 | 68 | 58 | 40 | 6 | 46.4 | 4.64 |
| Nassau | Florida | 24041 | 240 | 103 | 79 | 40 | 9 | 48.7 | 4.87 |
| Putnam | Florida | 26959 | 270 | 72 | 56 | 40 | 6 | 46.2 | 4.62 |
| St. Johns | Florida | 93323 | 933 | 112 | 85 | 40 | 9 | 49.4 | 4.94 |
| Sumter | Florida | 34210 | 342 | 79 | 80 | 40 | 9 | 48.8 | 4.88 |
| Suwannee | Florida | 12926 | 129 | 63 | 66 | 40 | 7 | 47.3 | 4.73 |
| Taylor | Florida | 4591 | 46 | 105 | 93 | 40 | 10 | 50.2 | 5.02 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Union | Florida | 6894 | 69 | 62 | 47 | 40 | 5 | 45.2 | 4.52 |
| Volusia | Florida | 339167 | 3392 | 120 | 111 | 40 | 12 | 52.2 | 5.22 |
| Brooks | Georgia | 20227 | 202 | 109 | 116 | 40 | 13 | 52.8 | 5.28 |
| Cook | Georgia | 20835 | 208 | 112 | 121 | 40 | 13 | 53.3 | 5.33 |
| Echols | Georgia | 6654 | 67 | 100 | 90 | 40 | 10 | 49.9 | 4.99 |
| Lanier | Georgia | 10506 | 105 | 91 | 99 | 40 | 11 | 50.9 | 5.09 |
| Lowndes | Georgia | 125105 | 1251 | 96 | 100 | 40 | 11 | 51.0 | 5.10 |

Table 5-7. Delivered cost for MSW used as a fuel source for the GRU Deerhaven facility (within a 2-hour travel time with competing demand)

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time to Deerhaven (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109705 | 1097 | 18 | 9.2 | 40 | 1 | 41.0 | 4.10 |
| Citrus | Florida | 97350 | 974 | 95 | 79 | 40 | 9 | 48.7 | 4.87 |
| Dixie | Florida | 3552 | 36 | 52 | 44 | 40 | 5 | 44.8 | 4.48 |
| Gilchrist | Florida | 4838 | 48 | 49 | 35 | 40 | 4 | 43.9 | 4.39 |
| Hamilton | Florida | 4579 | 46 | 68 | 67 | 40 | 7 | 47.4 | 4.74 |
| Hernando | Florida | 84291 | 843 | 119 | 109 | 40 | 12 | 52.0 | 5.20 |
| Lafayette | Florida | 1741 | 17 | 83 | 60 | 40 | 7 | 46.6 | 4.66 |
| Lake | Florida | 101584 | 1016 | 99 | 99 | 40 | 11 | 50.9 | 5.09 |
| Marion | Florida | 134557 | 1346 | 68 | 58 | 40 | 6 | 46.4 | 4.64 |
| Putnam | Florida | 26959 | 270 | 72 | 56 | 40 | 6 | 46.2 | 4.62 |
| Sumter | Florida | 34210 | 342 | 79 | 80 | 40 | 9 | 48.8 | 4.88 |
| Suwannee | Florida | 12926 | 129 | 63 | 66 | 40 | 7 | 47.3 | 4.73 |
| Cook | Georgia | 20835 | 208 | 112 | 121 | 40 | 13 | 53.3 | 5.33 |
| Lanier | Georgia | 10506 | 105 | 91 | 99 | 40 | 11 | 50.9 | 5.09 |
| Lowndes | Georgia | 125105 | 1251 | 96 | 100 | 40 | 11 | 51.0 | 5.10 |

Table 5-8. Delivered cost for MSW used as a fuel source for the JEA Brandy Branch facility (within a 2-hour travel time)

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 109705 | 1097 | 69 | 53.5 | 40 | 6 | 45.9 | 4.59 |
| Baker | Florida | 10344 | 103 | 23 | 23 | 40 | 3 | 42.5 | 4.25 |
| Bradford | Florida | 10562 | 106 | 36 | 32 | 40 | 4 | 43.5 | 4.35 |
| Clay | Florida | 102904 | 1029 | 50 | 44 | 40 | 5 | 44.8 | 4.48 |
| Columbia | Florida | 39711 | 397 | 50 | 48 | 40 | 5 | 45.3 | 4.53 |
| Duval | Florida | 492790 | 4928 | 8 | 8 | 40 | 1 | 40.9 | 4.09 |
| Flagler | Florida | 52501 | 525 | 96 | 87 | 40 | 10 | 49.6 | 4.96 |
| Gilchrist | Florida | 4838 | 48 | 100 | 100 | 40 | 11 | 51.0 | 5.10 |
| Hamilton | Florida | 4579 | 46 | 76 | 73 | 40 | 8 | 48.0 | 4.80 |
| Jefferson | Florida | 7817 | 78 | 98 | 110 | 40 | 12 | 52.1 | 5.21 |
| Lafayette | Florida | 1741 | 17 | 105 | 96 | 40 | 11 | 50.6 | 5.06 |
| Madison | Florida | 9848 | 98 | 98 | 110 | 40 | 12 | 52.1 | 5.21 |
| Marion | Florida | 134557 | 1346 | 117 | 92 | 40 | 10 | 50.1 | 5.01 |
| Nassau | Florida | 24041 | 240 | 33 | 25 | 40 | 3 | 42.8 | 4.28 |
| Putnam | Florida | 26959 | 270 | 85 | 67 | 40 | 7 | 47.4 | 4.74 |
| St. Johns | Florida | 93323 | 933 | 67 | 65 | 40 | 7 | 47.2 | 4.72 |
| Suwannee | Florida | 12926 | 129 | 66 | 71 | 40 | 8 | 47.8 | 4.78 |
| Union | Florida | 6894 | 69 | 34 | 28 | 40 | 3 | 43.1 | 4.31 |
| Volusia | Florida | 339167 | 3392 | 101 | 112 | 40 | 12 | 52.3 | 5.23 |
| Brantley | Georgia | 21391 | 214 | 94 | 71 | 40 | 8 | 47.8 | 4.78 |
| Brooks | Georgia | 20227 | 202 | 112 | 120 | 40 | 13 | 53.2 | 5.32 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Camden | Georgia | 69543 | 695 | 70 | 60 | 40 | 7 | 46.6 | 4.66 |
| Charlton | Georgia | 13944 | 139 | 69 | 50 | 40 | 6 | 45.5 | 4.55 |
| Clinch | Georgia | 8745 | 87 | 113 | 88 | 40 | 10 | 49.7 | 4.97 |
| Cook | Georgia | 20835 | 208 | 118 | 127 | 40 | 14 | 54.0 | 5.40 |
| Echols | Georgia | 6654 | 67 | 93 | 78 | 40 | 9 | 48.6 | 4.86 |
| Glynn | Georgia | 83827 | 838 | 86 | 91 | 40 | 10 | 50.0 | 5.00 |
| Lanier | Georgia | 10506 | 105 | 94 | 104 | 40 | 11 | 51.4 | 5.14 |
| Lowndes | Georgia | 125105 | 1251 | 102 | 106 | 40 | 12 | 51.7 | 5.17 |
| McIntosh | Georgia | 15182 | 152 | 109 | 108 | 40 | 12 | 51.9 | 5.19 |
| Pierce | Georgia | 20672 | 207 | 107 | 92 | 40 | 10 | 50.1 | 5.01 |
| Ware | Georgia | 41609 | 416 | 69 | 50 | 40 | 6 | 45.5 | 4.55 |

Table 5-9. Delivered cost for MSW used as a fuel source for the JEA Brandy Branch facility (within a 2-hour travel time with competing demand)

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Baker | Florida | 10344 | 103 | 23 | 23 | 40 | 3 | 42.5 | 4.25 |
| Bradford | Florida | 10562 | 106 | 36 | 32 | 40 | 4 | 43.5 | 4.35 |
| Clay | Florida | 102904 | 1029 | 50 | 44 | 40 | 5 | 44.8 | 4.48 |
| Columbia | Florida | 39711 | 397 | 50 | 48 | 40 | 5 | 45.3 | 4.53 |
| Duval | Florida | 492790 | 4928 | 8 | 8 | 40 | 1 | 40.9 | 4.09 |
| Flagler | Florida | 52501 | 525 | 96 | 87 | 40 | 10 | 49.6 | 4.96 |
| Nassau | Florida | 24041 | 240 | 33 | 25 | 40 | 3 | 42.8 | 4.28 |
| St. Johns | Florida | 93323 | 933 | 67 | 65 | 40 | 7 | 47.2 | 4.72 |
| Union | Florida | 6894 | 69 | 34 | 28 | 40 | 3 | 43.1 | 4.31 |
| Volusia | Florida | 339167 | 3392 | 101 | 112 | 40 | 12 | 52.3 | 5.23 |
| Brantley | Georgia | 21391 | 214 | 94 | 71 | 40 | 8 | 47.8 | 4.78 |
| Camden | Georgia | 69543 | 695 | 70 | 60 | 40 | 7 | 46.6 | 4.66 |
| Charlton | Georgia | 13944 | 139 | 69 | 50 | 40 | 6 | 45.5 | 4.55 |
| Clinch | Georgia | 8745 | 87 | 113 | 88 | 40 | 10 | 49.7 | 4.97 |
| Echols | Georgia | 6654 | 67 | 93 | 78 | 40 | 9 | 48.6 | 4.86 |
| Glynn | Georgia | 83827 | 838 | 86 | 91 | 40 | 10 | 50.0 | 5.00 |
| McIntosh | Georgia | 15182 | 152 | 109 | 108 | 40 | 12 | 51.9 | 5.19 |
| Pierce | Georgia | 20672 | 207 | 107 | 92 | 40 | 10 | 50.1 | 5.01 |
| Ware | Georgia | 41609 | 416 | 69 | 50 | 40 | 6 | 45.5 | 4.55 |

Table 5-10. Delivered cost for MSW used as a fuel source for the TAL Hopkins facility (within a 2-hour travel time)

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 3806 | 38 | 9 | 4 | 40 | 0 | 40.4 | 4.04 |
| Columbia | Florida | 39711 | 397 | 108 | 112 | 40 | 12 | 52.3 | 5.23 |
| Dixie | Florida | 3552 | 36 | 118 | 114 | 40 | 13 | 52.5 | 5.25 |
| Franklin | Florida | 5661 | 57 | 99 | 72 | 40 | 8 | 47.9 | 4.79 |
| Gadsden | Florida | 14850 | 149 | 31 | 24 | 40 | 3 | 42.6 | 4.26 |
| Hamilton | Florida | 4579 | 46 | 110 | 106 | 40 | 12 | 51.7 | 5.17 |
| Holmes | Florida | 4731 | 47 | 66 | 91 | 40 | 10 | 50.0 | 5.00 |
| Jackson | Florida | 24387 | 244 | 90 | 86 | 40 | 9 | 49.5 | 4.95 |
| Jefferson | Florida | 7817 | 78 | 52 | 53 | 40 | 6 | 45.8 | 4.58 |
| Lafayette | Florida | 1741 | 17 | 111 | 102 | 40 | 11 | 51.2 | 5.12 |
| Leon | Florida | 152504 | 1525 | 23 | 11 | 40 | 1 | 41.2 | 4.12 |
| Liberty | Florida | 2062 | 21 | 46 | 33 | 40 | 4 | 43.6 | 4.36 |
| Madison | Florida | 9848 | 98 | 52 | 53 | 40 | 6 | 45.8 | 4.58 |
| Suwannee | Florida | 12926 | 129 | 91 | 97 | 40 | 11 | 50.7 | 5.07 |
| Taylor | Florida | 4591 | 46 | 73 | 71 | 40 | 8 | 47.8 | 4.78 |
| Wakulla | Florida | 7383 | 74 | 33 | 24 | 40 | 3 | 42.6 | 4.26 |
| Walton | Florida | 46180 | 462 | 117 | 124 | 40 | 14 | 53.6 | 5.36 |
| Washington | Florida | 9395 | 94 | 83 | 86 | 40 | 9 | 49.5 | 4.95 |
| Baker | Georgia | 5217 | 52 | 97 | 75 | 40 | 8 | 48.3 | 4.83 |
| Brooks | Georgia | 20227 | 202 | 83 | 67 | 40 | 7 | 47.4 | 4.74 |
| Colquitt | Georgia | 54626 | 546 | 90 | 66 | 40 | 7 | 47.3 | 4.73 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Cook | Georgia | 20835 | 208 | 119 | 83 | 40 | 9 | 49.1 | 4.91 |
| Decatur | Georgia | 35662 | 356 | 52 | 42 | 40 | 5 | 44.6 | 4.46 |
| Dougherty | Georgia | 112838 | 1130 | 133 | 92 | 40 | 10 | 50.1 | 5.01 |
| Early | Georgia | 14917 | 149 | 95 | 81 | 40 | 9 | 48.9 | 4.89 |
| Grady | Georgia | 31140 | 311 | 55 | 32 | 40 | 4 | 43.5 | 4.35 |
| Lanier | Georgia | 10506 | 105 | 101 | 85 | 40 | 9 | 49.4 | 4.94 |
| Lowndes | Georgia | 125105 | 1251 | 101 | 79 | 40 | 9 | 48.7 | 4.87 |
| Miller | Georgia | 7570 | 76 | 96 | 67 | 40 | 7 | 47.4 | 4.74 |
| Mitchell | Georgia | 31797 | 318 | 94 | 63 | 40 | 7 | 46.9 | 4.69 |
| Seminole | Georgia | 11294 | 113 | 96 | 67 | 40 | 7 | 47.4 | 4.74 |
| Thomas | Georgia | 53622 | 536 | 55 | 41 | 40 | 5 | 44.5 | 4.45 |
| Worth | Georgia | 27853 | 279 | 90 | 65 | 40 | 7 | 47.2 | 4.72 |
| Henry | Alabama | 7620 | 76 | 115 | 112 | 40 | 12 | 52.3 | 5.23 |
| Houston | Alabama | 8996 | 90 | 96 | 71 | 40 | 8 | 47.8 | 4.78 |
| Geneva | Alabama | 48971 | 490 | 90 | 110 | 40 | 12 | 52.1 | 5.21 |

Table 5-11. Delivered cost for MSW used as a fuel source for the TAL Hopkins facility (within a 2-hour travel time with competing demand)

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 3806 | 38 | 9 | 4 | 40 | 0 | 40.4 | 4.04 |
| Franklin | Florida | 5661 | 57 | 99 | 72 | 40 | 8 | 47.9 | 4.79 |
| Gadsden | Florida | 14850 | 149 | 31 | 24 | 40 | 3 | 42.6 | 4.26 |
| Holmes | Florida | 4731 | 47 | 66 | 91 | 40 | 10 | 50.0 | 5.00 |
| Jackson | Florida | 24387 | 244 | 90 | 86 | 40 | 9 | 49.5 | 4.95 |
| Jefferson | Florida | 7817 | 78 | 52 | 53 | 40 | 6 | 45.8 | 4.58 |
| Leon | Florida | 152504 | 1525 | 23 | 11 | 40 | 1 | 41.2 | 4.12 |
| Liberty | Florida | 2062 | 21 | 46 | 33 | 40 | 4 | 43.6 | 4.36 |
| Madison | Florida | 9848 | 98 | 52 | 53 | 40 | 6 | 45.8 | 4.58 |
| Taylor | Florida | 4591 | 46 | 73 | 71 | 40 | 8 | 47.8 | 4.78 |
| Wakulla | Florida | 7383 | 74 | 33 | 24 | 40 | 3 | 42.6 | 4.26 |
| Walton | Florida | 46180 | 462 | 117 | 124 | 40 | 14 | 53.6 | 5.36 |
| Washington | Florida | 9395 | 94 | 83 | 86 | 40 | 9 | 49.5 | 4.95 |
| Baker | Georgia | 5217 | 52 | 97 | 75 | 40 | 8 | 48.3 | 4.83 |
| Brooks | Georgia | 20227 | 202 | 83 | 67 | 40 | 7 | 47.4 | 4.74 |
| Colquitt | Georgia | 54626 | 546 | 90 | 66 | 40 | 7 | 47.3 | 4.73 |
| Decatur | Georgia | 35662 | 357 | 52 | 42 | 40 | 5 | 44.6 | 4.46 |
| Dougherty | Georgia | 112838 | 1128 | 133 | 92 | 40 | 10 | 50.1 | 5.01 |
| Early | Georgia | 14917 | 149 | 95 | 81 | 40 | 9 | 48.9 | 4.89 |
| Grady | Georgia | 31140 | 311 | 55 | 32 | 40 | 4 | 43.5 | 4.35 |
| Miller | Georgia | 7570 | 76 | 96 | 67 | 40 | 7 | 47.4 | 4.74 |

| County | State | MSW (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Mitchell | Georgia | 31797 | 318 | 94 | 63 | 40 | 7 | 46.9 | 4.69 |
| Seminole | Georgia | 11294 | 113 | 96 | 67 | 40 | 7 | 47.4 | 4.74 |
| Thomas | Georgia | 53622 | 536 | 55 | 41 | 40 | 5 | 44.5 | 4.45 |
| Worth | Georgia | 27853 | 279 | 90 | 65 | 40 | 7 | 47.2 | 4.72 |
| Henry | Alabama | 7620 | 76 | 115 | 112 | 40 | 12 | 52.3 | 5.23 |
| Houston | Alabama | 8996 | 90 | 96 | 71 | 40 | 8 | 47.8 | 4.78 |
| Geneva | Alabama | 48971 | 490 | 90 | 110 | 40 | 12 | 52.1 | 5.21 |

# 6. YARD WASTE

## 6.1. Fuel Description

Yard waste is defined as the part of solid waste composed of vegetative matter resulting from landscaping maintenance or land clearing operations and includes materials such as tree and shrub trimmings, grass clippings, palm fronds, trees and tree stumps (Chapter 62-701, Florida Administrative Code). In Florida, roughly 4.3 million metric tons of yard trash was collected in 2005 and of this quantity a little more than half (54%) was recycled.

## 6.2. Current Management

In Florida yard waste is banned from disposal in lined landfill facilities. It is collected either by separate curbside collection or by the use of drop off facilities where a resident can go and drop off the yard waste. Disposal pathways for yard waste include mulch, composting/co-composting, tilled into the soil, and combustion. Similar bans on disposal of yard waste in lined landfills are also in place in Georgia. Effective Sept 1, 1996, each city, county and solid waste management authority is required to impose restrictions on yard waste generated in, or disposed within, their jurisdiction. The restriction requires that yard waste not be mixed with other MSW waste, be sorted and stored for collection in a fashion that facilitates composting or used as mulch or other beneficial reuse (GDCA, 2004).

## 6.3. Waste Projection

For the yard waste projections in the study area, the quantity of yard waste was calculated using the values reported by the various counties for waste generation. The amount of yard waste produced at different counties within the study region was projected using the projected population data and rate of production (Table 6-1).

Table 6-1. County level yard waste projections (in tons) for the next 5 years.

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29,255 | 29,720 | 30,168 | 30,608 | 31,070 | 31,527 |
| Baker | Florida | 3,708 | 3,769 | 3,839 | 3,914 | 3,966 | 4,017 |
| Bay | Florida | 19,523 | 19,838 | 20,139 | 20,429 | 20,726 | 21,018 |
| Bradford | Florida | 4,637 | 4,690 | 4,737 | 4,785 | 4,832 | 4,879 |
| Calhoun | Florida | 359 | 363 | 366 | 368 | 372 | 377 |
| Citrus | Florida | 43,267 | 44,179 | 45,047 | 45,893 | 46,772 | 47,637 |
| Clay | Florida | 20,930 | 21,577 | 22,208 | 22,828 | 23,449 | 24,061 |
| Columbia | Florida | 2,647 | 2,707 | 2,769 | 2,830 | 2,879 | 2,926 |
| Dixie | Florida | 807 | 823 | 837 | 850 | 865 | 880 |
| Duval | Florida | 150,575 | 152,966 | 155,276 | 157,539 | 159,919 | 162,268 |
| Flagler | Florida | 21,000 | 22,085 | 23,003 | 23,829 | 24,949 | 26,057 |
| Franklin | Florida | 2,702 | 2,810 | 2,919 | 3,023 | 3,068 | 3,106 |
| Gadsden | Florida | 5,269 | 5,318 | 5,358 | 5,392 | 5,432 | 5,471 |
| Gilchrist | Florida | 161 | 166 | 171 | 176 | 180 | 184 |
| Gulf | Florida | 6,728 | 6,797 | 6,850 | 6,901 | 6,960 | 7,022 |
| Hamilton | Florida | 1,145 | 1,155 | 1,167 | 1,180 | 1,188 | 1,196 |
| Hernando | Florida | 23,414 | 23,954 | 24,446 | 24,910 | 25,452 | 25,988 |
| Holmes | Florida | 394 | 397 | 401 | 404 | 407 | 409 |
| Jackson | Florida | 4,258 | 4,318 | 4,373 | 4,424 | 4,464 | 4,500 |
| Jefferson | Florida | 927 | 937 | 946 | 955 | 963 | 972 |
| Lafayette | Florida | 92 | 92 | 92 | 92 | 93 | 94 |
| Lake | Florida | 32,652 | 33,798 | 34,912 | 36,005 | 37,109 | 38,199 |
| Leon | Florida | 17,942 | 18,251 | 18,536 | 18,806 | 19,130 | 19,450 |
| Levy | Florida | 774 | 792 | 812 | 831 | 848 | 864 |
| Liberty | Florida | 169 | 171 | 172 | 172 | 173 | 175 |
| Madison | Florida | 1,672 | 1,688 | 1,702 | 1,717 | 1,731 | 1,745 |
| Marion | Florida | 39,383 | 40,475 | 41,507 | 42,499 | 43,561 | 44,606 |
| Nassau | Florida | 633 | 651 | 670 | 690 | 706 | 722 |
| Orange | Florida | 235,706 | 242,347 | 248,993 | 255,595 | 261,873 | 268,057 |
| Pasco | Florida | 84,286 | 86,391 | 88,286 | 90,062 | 92,209 | 94,328 |
| Putnam | Florida | 12,254 | 12,358 | 12,469 | 12,577 | 12,675 | 12,777 |
| St. Johns | Florida | 27,573 | 28,635 | 29,655 | 30,648 | 31,680 | 32,703 |
| Sumter | Florida | 6,284 | 6,527 | 6,717 | 6,876 | 7,136 | 7,395 |
| Suwannee | Florida | 2,693 | 2,751 | 2,812 | 2,876 | 2,928 | 2,980 |
| Taylor | Florida | 1,640 | 1,666 | 1,691 | 1,716 | 1,741 | 1,767 |
| Union | Florida | 2,103 | 2,136 | 2,162 | 2,185 | 2,210 | 2,231 |
| Volusia | Florida | 139,657 | 142,393 | 145,097 | 147,760 | 150,359 | 152,912 |
| Wakulla | Florida | 127 | 133 | 138 | 143 | 147 | 151 |
| Walton | Florida | 1,592 | 1,618 | 1,642 | 1,666 | 1,691 | 1,716 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Washington | Florida | 671 | 690 | 709 | 727 | 739 | 750 |
| Baker | Georgia | 858 | 869 | 880 | 891 | 902 | 913 |
| Brantley | Georgia | 3,516 | 3,629 | 3,746 | 3,866 | 3,990 | 4,117 |
| Brooks | Georgia | 3,325 | 3,348 | 3,371 | 3,394 | 3,417 | 3,440 |
| Calhoun | Georgia | 1,458 | 1,496 | 1,535 | 1,576 | 1,617 | 1,659 |
| Camden | Georgia | 11,432 | 11,943 | 12,478 | 13,036 | 13,619 | 14,228 |
| Charlton | Georgia | 2,292 | 2,340 | 2,390 | 2,440 | 2,491 | 2,543 |
| Clinch | Georgia | 1,438 | 1,454 | 1,471 | 1,488 | 1,506 | 1,523 |
| Colquitt | Georgia | 8,980 | 9,112 | 9,247 | 9,383 | 9,522 | 9,662 |
| Cook | Georgia | 3,425 | 3,484 | 3,544 | 3,605 | 3,667 | 3,730 |
| Decatur | Georgia | 5,862 | 5,925 | 5,988 | 6,052 | 6,116 | 6,182 |
| Dougherty | Georgia | 18,549 | 18,554 | 18,559 | 18,564 | 18,569 | 18,574 |
| Early | Georgia | 2,452 | 2,462 | 2,473 | 2,483 | 2,494 | 2,504 |
| Echols | Georgia | 1,094 | 1,160 | 1,231 | 1,306 | 1,385 | 1,470 |
| Glynn | Georgia | 13,780 | 13,892 | 14,004 | 14,118 | 14,233 | 14,348 |
| Grady | Georgia | 5,119 | 5,204 | 5,291 | 5,379 | 5,469 | 5,560 |
| Lanier | Georgia | 1,727 | 1,780 | 1,835 | 1,892 | 1,951 | 2,011 |
| Lowndes | Georgia | 20,565 | 21,002 | 21,448 | 21,903 | 22,368 | 22,843 |
| McIntosh | Georgia | 2,496 | 2,560 | 2,625 | 2,692 | 2,761 | 2,832 |
| Miller | Georgia | 1,244 | 1,246 | 1,248 | 1,250 | 1,253 | 1,255 |
| Mitchell | Georgia | 5,227 | 5,321 | 5,417 | 5,515 | 5,614 | 5,716 |
| Pierce | Georgia | 3,398 | 3,457 | 3,517 | 3,578 | 3,640 | 3,703 |
| Seminole | Georgia | 1,857 | 1,864 | 1,871 | 1,879 | 1,886 | 1,894 |
| Thomas | Georgia | 8,815 | 8,901 | 8,987 | 9,075 | 9,163 | 9,252 |
| Ware | Georgia | 6,840 | 6,840 | 6,840 | 6,841 | 6,841 | 6,841 |
| Wayne | Georgia | 5,834 | 5,943 | 6,055 | 6,169 | 6,286 | 6,404 |
| Worth | Georgia | 4,579 | 4,630 | 4,682 | 4,735 | 4,788 | 4,842 |
| Henry | Alabama | 1,253 | 1,269 | 1,285 | 1,301 | 1,318 | 1,334 |
| Houston | Alabama | 1,479 | 1,498 | 1,517 | 1,536 | 1,556 | 1,575 |
| Geneva | Alabama | 8,050 | 8,062 | 8,164 | 8,264 | 8,374 | 8,479 |

Table 6-2 presents yard waste projections in potential Btu of energy if all yard waste produced is used as fuel. A value of 4,200 Btu/lb was used for the energy conversion.

Table 6-2. County level yard waste projections (in billion Btu) for the next 5 years.

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 246 | 250 | 253 | 257 | 261 | 265 |
| Baker | Florida | 31 | 32 | 32 | 33 | 33 | 34 |
| Bay | Florida | 164 | 167 | 169 | 172 | 174 | 177 |
| Bradford | Florida | 39 | 39 | 40 | 40 | 41 | 41 |
| Calhoun | Florida | 3 | 3 | 3 | 3 | 3 | 3 |
| Citrus | Florida | 363 | 371 | 378 | 386 | 393 | 400 |
| Clay | Florida | 176 | 181 | 187 | 192 | 197 | 202 |
| Columbia | Florida | 22 | 23 | 23 | 24 | 24 | 25 |
| Dixie | Florida | 7 | 7 | 7 | 7 | 7 | 7 |
| Duval | Florida | 1265 | 1285 | 1304 | 1323 | 1343 | 1363 |
| Flagler | Florida | 176 | 186 | 193 | 200 | 210 | 219 |
| Franklin | Florida | 23 | 24 | 25 | 25 | 26 | 26 |
| Gadsden | Florida | 44 | 45 | 45 | 45 | 46 | 46 |
| Gilchrist | Florida | 1 | 1 | 1 | 1 | 2 | 2 |
| Gulf | Florida | 57 | 57 | 58 | 58 | 58 | 59 |
| Hamilton | Florida | 10 | 10 | 10 | 10 | 10 | 10 |
| Hernando | Florida | 197 | 201 | 205 | 209 | 214 | 218 |
| Holmes | Florida | 3 | 3 | 3 | 3 | 3 | 3 |
| Jackson | Florida | 36 | 36 | 37 | 37 | 37 | 38 |
| Jefferson | Florida | 8 | 8 | 8 | 8 | 8 | 8 |
| Lafayette | Florida | 1 | 1 | 1 | 1 | 1 | 1 |
| Lake | Florida | 274 | 284 | 293 | 302 | 312 | 321 |
| Leon | Florida | 151 | 153 | 156 | 158 | 161 | 163 |
| Levy | Florida | 7 | 7 | 7 | 7 | 7 | 7 |
| Liberty | Florida | 1 | 1 | 1 | 1 | 1 | 1 |
| Madison | Florida | 14 | 14 | 14 | 14 | 15 | 15 |
| Marion | Florida | 331 | 340 | 349 | 357 | 366 | 375 |
| Nassau | Florida | 5 | 5 | 6 | 6 | 6 | 6 |
| Orange | Florida | 1980 | 2036 | 2092 | 2147 | 2200 | 2252 |
| Pasco | Florida | 708 | 726 | 742 | 757 | 775 | 792 |
| Putnam | Florida | 103 | 104 | 105 | 106 | 106 | 107 |
| St. Johns | Florida | 232 | 241 | 249 | 257 | 266 | 275 |
| Sumter | Florida | 53 | 55 | 56 | 58 | 60 | 62 |
| Suwannee | Florida | 23 | 23 | 24 | 24 | 25 | 25 |
| Taylor | Florida | 14 | 14 | 14 | 14 | 15 | 15 |
| Union | Florida | 18 | 18 | 18 | 18 | 19 | 19 |
| Volusia | Florida | 1173 | 1196 | 1219 | 1241 | 1263 | 1284 |
| Wakulla | Florida | 1 | 1 | 1 | 1 | 1 | 1 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Walton | Florida | 13 | 14 | 14 | 14 | 14 | 14 |
| Washington | Florida | 6 | 6 | 6 | 6 | 6 | 6 |
| Baker | Georgia | 7 | 7 | 7 | 7 | 8 | 8 |
| Brantley | Georgia | 30 | 30 | 31 | 32 | 34 | 35 |
| Brooks | Georgia | 28 | 28 | 28 | 29 | 29 | 29 |
| Calhoun | Georgia | 12 | 13 | 13 | 13 | 14 | 14 |
| Camden | Georgia | 96 | 100 | 105 | 110 | 114 | 120 |
| Charlton | Georgia | 19 | 20 | 20 | 20 | 21 | 21 |
| Clinch | Georgia | 12 | 12 | 12 | 13 | 13 | 13 |
| Colquitt | Georgia | 75 | 77 | 78 | 79 | 80 | 81 |
| Cook | Georgia | 29 | 29 | 30 | 30 | 31 | 31 |
| Decatur | Georgia | 49 | 50 | 50 | 51 | 51 | 52 |
| Dougherty | Georgia | 156 | 156 | 156 | 156 | 156 | 156 |
| Early | Georgia | 21 | 21 | 21 | 21 | 21 | 21 |
| Echols | Georgia | 9 | 10 | 10 | 11 | 12 | 12 |
| Glynn | Georgia | 116 | 117 | 118 | 119 | 120 | 121 |
| Grady | Georgia | 43 | 44 | 44 | 45 | 46 | 47 |
| Lanier | Georgia | 15 | 15 | 15 | 16 | 16 | 17 |
| Lowndes | Georgia | 173 | 176 | 180 | 184 | 188 | 192 |
| McIntosh | Georgia | 21 | 22 | 22 | 23 | 23 | 24 |
| Miller | Georgia | 10 | 10 | 10 | 11 | 11 | 11 |
| Mitchell | Georgia | 44 | 45 | 46 | 46 | 47 | 48 |
| Pierce | Georgia | 29 | 29 | 30 | 30 | 31 | 31 |
| Seminole | Georgia | 16 | 16 | 16 | 16 | 16 | 16 |
| Thomas | Georgia | 74 | 75 | 75 | 76 | 77 | 78 |
| Ware | Georgia | 57 | 57 | 57 | 57 | 57 | 57 |
| Wayne | Georgia | 49 | 50 | 51 | 52 | 53 | 54 |
| Worth | Georgia | 38 | 39 | 39 | 40 | 40 | 41 |
| Henry | Alabama | 11 | 11 | 11 | 11 | 11 | 11 |
| Houston | Alabama | 12 | 13 | 13 | 13 | 13 | 13 |
| Geneva | Alabama | 68 | 68 | 69 | 69 | 70 | 71 |

### 6.4. Feasibility Assessment

Within a specific region yard waste is collected at several clean wood recycling facilities. Part of yard waste from households also gets dropped off at an active landfill site or at a transfer station. This yard waste gets ground and composted on site and given away to the public free as mulch. The processing cost of yard waste for fuel applications (grinding and producing mulch type end

product) is approximately $20/ton (personal communication, Florida Wood Recycling, Town of Medley, 2007). The transportation cost was calculated based on the distance from the waste disposal facility and the corresponding nearest power plant facility. Tables 6-3 thru 6-5 present the delivered cost per MMBtu for yard waste from counties to the three power generation units targeted in this study. The scenario of all the waste from a specific county being available for all the three facilities is shown (without competing demand between facilities). The cost calculations are only for the year 2007. The other two scenarios for the three facilities one considering two hour travel time from the waste collection center to the power plant (with no competing demand) and the other considering the 2-hour travel time with competing demand (and assuming that the waste goes to the nearest facility in case of two or more facilities being within a travel time range of 2-hour is presented for the three facilities in Table 6-6 thru 6-11. Similar calculation can be performed for other years. The major part of cost is from the processing of waste before its use as fuel. As mentioned before in this document, the income from tipping fee has not been included in this calculation.

Table 6-3. Delivered cost for yard waste used as a fuel source for the GRU Deerhaven facility.

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29255 | 246 | 18 | 9.2 | 20 | 1 | 21.0 | 2.50 |
| Baker | Florida | 3708 | 31 | 67 | 55 | 20 | 6 | 26.1 | 3.10 |
| Bay | Florida | 19523 | 164 | 266 | 266 | 20 | 29 | 49.3 | 5.86 |
| Bradford | Florida | 4637 | 39 | 51 | 37 | 20 | 4 | 24.1 | 2.87 |
| Calhoun | Florida | 359 | 3 | 174 | 149 | 20 | 16 | 36.4 | 4.33 |
| Citrus | Florida | 43267 | 363 | 95 | 79 | 20 | 9 | 28.7 | 3.42 |
| Clay | Florida | 20930 | 176 | 78 | 60 | 20 | 7 | 26.6 | 3.17 |
| Columbia | Florida | 2647 | 22 | 52 | 51 | 20 | 6 | 25.6 | 3.05 |
| Dixie | Florida | 807 | 7 | 52 | 44 | 20 | 5 | 24.8 | 2.96 |
| Duval | Florida | 150575 | 1265 | 76 | 63 | 20 | 7 | 26.9 | 3.21 |
| Flagler | Florida | 21000 | 176 | 123 | 81 | 20 | 9 | 28.9 | 3.44 |
| Franklin | Florida | 2702 | 23 | 222 | 208 | 20 | 23 | 42.9 | 5.10 |
| Gadsden | Florida | 5269 | 44 | 152 | 167 | 20 | 18 | 38.4 | 4.57 |
| Gilchrist | Florida | 161 | 1 | 49 | 35 | 20 | 4 | 23.9 | 2.84 |
| Gulf | Florida | 6728 | 57 | 255 | 243 | 20 | 27 | 46.7 | 5.56 |
| Hamilton | Florida | 1145 | 10 | 68 | 67 | 20 | 7 | 27.4 | 3.26 |
| Hernando | Florida | 23414 | 197 | 119 | 109 | 20 | 12 | 32.0 | 3.81 |
| Holmes | Florida | 394 | 3 | 208 | 234 | 20 | 26 | 45.7 | 5.45 |
| Jackson | Florida | 4258 | 36 | 209 | 225 | 20 | 25 | 44.8 | 5.33 |
| Jefferson | Florida | 927 | 8 | 95 | 105 | 20 | 12 | 31.6 | 3.76 |
| Lafayette | Florida | 92 | 1 | 83 | 60 | 20 | 7 | 26.6 | 3.17 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 32652 | 274 | 99 | 99 | 20 | 11 | 30.9 | 3.68 |
| Leon | Florida | 17942 | 151 | 129 | 135 | 20 | 15 | 34.9 | 4.15 |
| Levy | Florida | 774 | 7 | 69 | 48 | 20 | 5 | 25.3 | 3.01 |
| Liberty | Florida | 169 | 1 | 173 | 185 | 20 | 20 | 40.4 | 4.80 |
| Madison | Florida | 1672 | 14 | 95 | 105 | 20 | 12 | 31.6 | 3.76 |
| Marion | Florida | 39383 | 331 | 68 | 58 | 20 | 6 | 26.4 | 3.14 |
| Nassau | Florida | 633 | 5 | 103 | 79 | 20 | 9 | 28.7 | 3.42 |
| Orange | Florida | 235706 | 1980 | 134 | 137 | 20 | 15 | 35.1 | 4.18 |
| Pasco | Florida | 84286 | 708 | 145 | 139 | 20 | 15 | 35.3 | 4.20 |
| Putnam | Florida | 12254 | 103 | 72 | 56 | 20 | 6 | 26.2 | 3.11 |
| St. Johns | Florida | 27573 | 232 | 112 | 85 | 20 | 9 | 29.4 | 3.49 |
| Sumter | Florida | 6284 | 53 | 79 | 80 | 20 | 9 | 28.8 | 3.43 |
| Suwannee | Florida | 2693 | 23 | 63 | 66 | 20 | 7 | 27.3 | 3.25 |
| Taylor | Florida | 1640 | 14 | 105 | 93 | 20 | 10 | 30.2 | 3.60 |
| Union | Florida | 2103 | 18 | 62 | 47 | 20 | 5 | 25.2 | 3.00 |
| Volusia | Florida | 139657 | 1173 | 120 | 111 | 20 | 12 | 32.2 | 3.83 |
| Wakulla | Florida | 127 | 1 | 160 | 164 | 20 | 18 | 38.0 | 4.53 |
| Walton | Florida | 1592 | 13 | 240 | 267 | 20 | 29 | 49.4 | 5.88 |
| Washington | Florida | 671 | 6 | 205 | 229 | 20 | 25 | 45.2 | 5.38 |
| Baker | Georgia | 858 | 7 | 187 | 185 | 20 | 20 | 40.4 | 4.80 |
| Brantley | Georgia | 3516 | 30 | 163 | 119 | 20 | 13 | 33.1 | 3.94 |
| Brooks | Georgia | 3325 | 28 | 109 | 116 | 20 | 13 | 32.8 | 3.90 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 1458 | 12 | 228 | 214 | 20 | 24 | 43.5 | 5.18 |
| Camden | Georgia | 11432 | 96 | 135 | 116 | 20 | 13 | 32.8 | 3.90 |
| Charlton | Georgia | 2292 | 19 | 131 | 97 | 20 | 11 | 30.7 | 3.65 |
| Clinch | Georgia | 1438 | 12 | 133 | 135 | 20 | 15 | 34.9 | 4.15 |
| Colquitt | Georgia | 8980 | 75 | 150 | 141 | 20 | 16 | 35.5 | 4.23 |
| Cook | Georgia | 3425 | 29 | 112 | 121 | 20 | 13 | 33.3 | 3.97 |
| Decatur | Georgia | 5862 | 49 | 174 | 185 | 20 | 20 | 40.4 | 4.80 |
| Dougherty | Georgia | 18549 | 156 | 178 | 178 | 20 | 20 | 39.6 | 4.71 |
| Early | Georgia | 2452 | 21 | 227 | 224 | 20 | 25 | 44.6 | 5.31 |
| Echols | Georgia | 1094 | 9 | 100 | 90 | 20 | 10 | 29.9 | 3.56 |
| Glynn | Georgia | 13780 | 116 | 153 | 145 | 20 | 16 | 36.0 | 4.28 |
| Grady | Georgia | 5119 | 43 | 172 | 170 | 20 | 19 | 38.7 | 4.61 |
| Lanier | Georgia | 1727 | 15 | 91 | 99 | 20 | 11 | 30.9 | 3.68 |
| Lowndes | Georgia | 20565 | 173 | 96 | 100 | 20 | 11 | 31.0 | 3.69 |
| McIntosh | Georgia | 2496 | 21 | 175 | 164 | 20 | 18 | 38.0 | 4.53 |
| Miller | Georgia | 1244 | 10 | 212 | 203 | 20 | 22 | 42.3 | 5.04 |
| Mitchell | Georgia | 5227 | 44 | 173 | 164 | 20 | 18 | 38.0 | 4.53 |
| Pierce | Georgia | 3398 | 29 | 174 | 147 | 20 | 16 | 36.2 | 4.31 |
| Seminole | Georgia | 1857 | 16 | 212 | 203 | 20 | 22 | 42.3 | 5.04 |
| Thomas | Georgia | 8815 | 74 | 140 | 138 | 20 | 15 | 35.2 | 4.19 |
| Ware | Georgia | 6840 | 57 | 131 | 97 | 20 | 11 | 30.7 | 3.65 |
| Wayne | Georgia | 5834 | 49 | 191 | 142 | 20 | 16 | 35.6 | 4.24 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 4579 | 38 | 150 | 141 | 20 | 16 | 35.5 | 4.23 |
| Henry | Alabama | 1253 | 11 | 270 | 273 | 20 | 30 | 50.0 | 5.96 |
| Houston | Alabama | 1479 | 12 | 212 | 203 | 20 | 22 | 42.3 | 5.04 |
| Geneva | Alabama | 8050 | 68 | 230 | 254 | 20 | 28 | 47.9 | 5.71 |

Table 6-4. Delivered cost for yard waste used as a fuel source for the JEA Brandy Branch facility.

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29255 | 246 | 69 | 53.5 | 20 | 6 | 25.9 | 1.85 |
| Baker | Florida | 3708 | 31 | 23 | 23 | 20 | 3 | 22.5 | 1.61 |
| Bay | Florida | 19523 | 164 | 272 | 272 | 20 | 30 | 49.9 | 3.57 |
| Bradford | Florida | 4637 | 39 | 36 | 32 | 20 | 4 | 23.5 | 1.68 |
| Calhoun | Florida | 359 | 3 | 167 | 154 | 20 | 17 | 36.9 | 2.64 |
| Citrus | Florida | 43267 | 363 | 150 | 122 | 20 | 13 | 33.4 | 2.39 |
| Clay | Florida | 20930 | 176 | 50 | 44 | 20 | 5 | 24.8 | 1.77 |
| Columbia | Florida | 2647 | 22 | 50 | 48 | 20 | 5 | 25.3 | 1.81 |
| Dixie | Florida | 807 | 7 | 127 | 109 | 20 | 12 | 32.0 | 2.29 |
| Duval | Florida | 150575 | 1265 | 8 | 8 | 20 | 1 | 20.9 | 1.49 |
| Flagler | Florida | 21000 | 176 | 96 | 87 | 20 | 10 | 29.6 | 2.11 |
| Franklin | Florida | 2702 | 23 | 228 | 214 | 20 | 24 | 43.5 | 3.11 |
| Gadsden | Florida | 5269 | 44 | 155 | 171 | 20 | 19 | 38.8 | 2.77 |
| Gilchrist | Florida | 161 | 1 | 100 | 100 | 20 | 11 | 31.0 | 2.21 |
| Gulf | Florida | 6728 | 57 | 261 | 249 | 20 | 27 | 47.4 | 3.39 |
| Hamilton | Florida | 1145 | 10 | 76 | 73 | 20 | 8 | 28.0 | 2.00 |
| Hernando | Florida | 23414 | 197 | 175 | 152 | 20 | 17 | 36.7 | 2.62 |
| Holmes | Florida | 394 | 3 | 210 | 239 | 20 | 26 | 46.3 | 3.31 |
| Jackson | Florida | 4258 | 36 | 215 | 232 | 20 | 26 | 45.5 | 3.25 |
| Jefferson | Florida | 927 | 8 | 98 | 110 | 20 | 12 | 32.1 | 2.29 |
| Lafayette | Florida | 92 | 1 | 105 | 96 | 20 | 11 | 30.6 | 2.18 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 32652 | 274 | 165 | 142 | 20 | 16 | 35.6 | 2.54 |
| Leon | Florida | 17942 | 151 | 135 | 141 | 20 | 16 | 35.5 | 2.54 |
| Levy | Florida | 774 | 7 | 128 | 93 | 20 | 10 | 30.2 | 2.16 |
| Liberty | Florida | 169 | 1 | 176 | 190 | 20 | 21 | 40.9 | 2.92 |
| Madison | Florida | 1672 | 14 | 98 | 110 | 20 | 12 | 32.1 | 2.29 |
| Marion | Florida | 39383 | 331 | 117 | 92 | 20 | 10 | 30.1 | 2.15 |
| Nassau | Florida | 633 | 5 | 33 | 25 | 20 | 3 | 22.8 | 1.63 |
| Orange | Florida | 235706 | 1980 | 161 | 167 | 20 | 18 | 38.4 | 2.74 |
| Pasco | Florida | 84286 | 708 | 200 | 182 | 20 | 20 | 40.0 | 2.86 |
| Putnam | Florida | 12254 | 103 | 85 | 67 | 20 | 7 | 27.4 | 1.96 |
| St. Johns | Florida | 27573 | 232 | 67 | 65 | 20 | 7 | 27.2 | 1.94 |
| Sumter | Florida | 6284 | 53 | 134 | 123 | 20 | 14 | 33.5 | 2.40 |
| Suwannee | Florida | 2693 | 23 | 66 | 71 | 20 | 8 | 27.8 | 1.99 |
| Taylor | Florida | 1640 | 14 | 134 | 135 | 20 | 15 | 34.9 | 2.49 |
| Union | Florida | 2103 | 18 | 34 | 28 | 20 | 3 | 23.1 | 1.65 |
| Volusia | Florida | 139657 | 1173 | 101 | 112 | 20 | 12 | 32.3 | 2.31 |
| Wakulla | Florida | 127 | 1 | 182 | 170 | 20 | 19 | 38.7 | 2.76 |
| Walton | Florida | 1592 | 13 | 240 | 272 | 20 | 30 | 49.9 | 3.57 |
| Washington | Florida | 671 | 6 | 207 | 234 | 20 | 26 | 45.7 | 3.27 |
| Baker | Georgia | 858 | 7 | 190 | 190 | 20 | 21 | 40.9 | 2.92 |
| Brantley | Georgia | 3516 | 30 | 94 | 71 | 20 | 8 | 27.8 | 1.99 |
| Brooks | Georgia | 3325 | 28 | 112 | 120 | 20 | 13 | 33.2 | 2.37 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 1458 | 12 | 234 | 220 | 20 | 24 | 44.2 | 3.16 |
| Camden | Georgia | 11432 | 96 | 70 | 60 | 20 | 7 | 26.6 | 1.90 |
| Charlton | Georgia | 2292 | 19 | 69 | 50 | 20 | 6 | 25.5 | 1.82 |
| Clinch | Georgia | 1438 | 12 | 113 | 88 | 20 | 10 | 29.7 | 2.12 |
| Colquitt | Georgia | 8980 | 75 | 155 | 147 | 20 | 16 | 36.2 | 2.58 |
| Cook | Georgia | 3425 | 29 | 118 | 127 | 20 | 14 | 34.0 | 2.43 |
| Decatur | Georgia | 5862 | 49 | 177 | 190 | 20 | 21 | 40.9 | 2.92 |
| Dougherty | Georgia | 18549 | 156 | 185 | 185 | 20 | 20 | 40.4 | 2.88 |
| Early | Georgia | 2452 | 21 | 229 | 229 | 20 | 25 | 45.2 | 3.23 |
| Echols | Georgia | 1094 | 9 | 93 | 78 | 20 | 9 | 28.6 | 2.04 |
| Glynn | Georgia | 13780 | 116 | 86 | 91 | 20 | 10 | 30.0 | 2.14 |
| Grady | Georgia | 5119 | 43 | 178 | 177 | 20 | 19 | 39.5 | 2.82 |
| Lanier | Georgia | 1727 | 15 | 94 | 104 | 20 | 11 | 31.4 | 2.25 |
| Lowndes | Georgia | 20565 | 173 | 102 | 106 | 20 | 12 | 31.7 | 2.26 |
| McIntosh | Georgia | 2496 | 21 | 109 | 108 | 20 | 12 | 31.9 | 2.28 |
| Miller | Georgia | 1244 | 10 | 218 | 209 | 20 | 23 | 43.0 | 3.07 |
| Mitchell | Georgia | 5227 | 44 | 180 | 171 | 20 | 19 | 38.8 | 2.77 |
| Pierce | Georgia | 3398 | 29 | 107 | 92 | 20 | 10 | 30.1 | 2.15 |
| Seminole | Georgia | 1857 | 16 | 218 | 209 | 20 | 23 | 43.0 | 3.07 |
| Thomas | Georgia | 8815 | 74 | 147 | 144 | 20 | 16 | 35.8 | 2.56 |
| Ware | Georgia | 6840 | 57 | 69 | 50 | 20 | 6 | 25.5 | 1.82 |
| Wayne | Georgia | 5834 | 49 | 121 | 93 | 20 | 10 | 30.2 | 2.16 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 4579 | 38 | 155 | 147 | 20 | 16 | 36.2 | 2.58 |
| Henry | Alabama | 1253 | 11 | 265 | 254 | 20 | 28 | 47.9 | 3.42 |
| Houston | Alabama | 1479 | 12 | 218 | 209 | 20 | 23 | 43.0 | 3.07 |
| Geneva | Alabama | 8050 | 68 | 240 | 261 | 20 | 29 | 48.7 | 3.48 |

Table 6-5. Delivered cost for yard waste used as a fuel source for the TAL Hopkins facility.

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29255 | 246 | 154 | 159 | 20 | 17 | 37.5 | 4.46 |
| Baker | Florida | 3708 | 31 | 122 | 135 | 20 | 15 | 34.9 | 4.15 |
| Bay | Florida | 19523 | 164 | 147 | 126 | 20 | 14 | 33.9 | 4.03 |
| Bradford | Florida | 4637 | 39 | 161 | 164 | 20 | 18 | 38.0 | 4.53 |
| Calhoun | Florida | 359 | 3 | 9 | 4 | 20 | 0 | 20.4 | 2.43 |
| Citrus | Florida | 43267 | 363 | 218 | 221 | 20 | 24 | 44.3 | 5.28 |
| Clay | Florida | 20930 | 176 | 181 | 192 | 20 | 21 | 41.1 | 4.90 |
| Columbia | Florida | 2647 | 22 | 108 | 112 | 20 | 12 | 32.3 | 3.85 |
| Dixie | Florida | 807 | 7 | 118 | 114 | 20 | 13 | 32.5 | 3.87 |
| Duval | Florida | 150575 | 1265 | 140 | 157 | 20 | 17 | 37.3 | 4.44 |
| Flagler | Florida | 21000 | 176 | 230 | 239 | 20 | 26 | 46.3 | 5.51 |
| Franklin | Florida | 2702 | 23 | 99 | 72 | 20 | 8 | 27.9 | 3.32 |
| Gadsden | Florida | 5269 | 44 | 31 | 24 | 20 | 3 | 22.6 | 2.70 |
| Gilchrist | Florida | 161 | 1 | 148 | 151 | 20 | 17 | 36.6 | 4.36 |
| Gulf | Florida | 6728 | 57 | 136 | 97 | 20 | 11 | 30.7 | 3.65 |
| Hamilton | Florida | 1145 | 10 | 110 | 106 | 20 | 12 | 31.7 | 3.77 |
| Hernando | Florida | 23414 | 197 | 231 | 187 | 20 | 21 | 40.6 | 4.83 |
| Holmes | Florida | 394 | 3 | 66 | 91 | 20 | 10 | 30.0 | 3.57 |
| Jackson | Florida | 4258 | 36 | 90 | 86 | 20 | 9 | 29.5 | 3.51 |
| Jefferson | Florida | 927 | 8 | 52 | 53 | 20 | 6 | 25.8 | 3.08 |
| Lafayette | Florida | 92 | 1 | 111 | 102 | 20 | 11 | 31.2 | 3.72 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 32652 | 274 | 233 | 241 | 20 | 27 | 46.5 | 5.54 |
| Leon | Florida | 17942 | 151 | 23 | 11 | 20 | 1 | 21.2 | 2.53 |
| Levy | Florida | 774 | 7 | 170 | 137 | 20 | 15 | 35.1 | 4.18 |
| Liberty | Florida | 169 | 1 | 46 | 33 | 20 | 4 | 23.6 | 2.81 |
| Madison | Florida | 1672 | 14 | 52 | 53 | 20 | 6 | 25.8 | 3.08 |
| Marion | Florida | 39383 | 331 | 192 | 200 | 20 | 22 | 42.0 | 5.00 |
| Nassau | Florida | 633 | 5 | 155 | 178 | 20 | 20 | 39.6 | 4.71 |
| Orange | Florida | 235706 | 1980 | 257 | 279 | 20 | 31 | 50.7 | 6.03 |
| Pasco | Florida | 84286 | 708 | 268 | 281 | 20 | 31 | 50.9 | 6.06 |
| Putnam | Florida | 12254 | 103 | 204 | 206 | 20 | 23 | 42.7 | 5.08 |
| St. Johns | Florida | 27573 | 232 | 198 | 213 | 20 | 23 | 43.4 | 5.17 |
| Sumter | Florida | 6284 | 53 | 202 | 222 | 20 | 24 | 44.4 | 5.29 |
| Suwannee | Florida | 2693 | 23 | 91 | 97 | 20 | 11 | 30.7 | 3.65 |
| Taylor | Florida | 1640 | 14 | 73 | 71 | 20 | 8 | 27.8 | 3.31 |
| Union | Florida | 2103 | 18 | 145 | 153 | 20 | 17 | 36.8 | 4.38 |
| Volusia | Florida | 139657 | 1173 | 232 | 260 | 20 | 29 | 48.6 | 5.79 |
| Wakulla | Florida | 127 | 1 | 33 | 24 | 20 | 3 | 22.6 | 2.70 |
| Walton | Florida | 1592 | 13 | 117 | 124 | 20 | 14 | 33.6 | 4.00 |
| Washington | Florida | 671 | 6 | 83 | 86 | 20 | 9 | 29.5 | 3.51 |
| Baker | Georgia | 858 | 7 | 97 | 75 | 20 | 8 | 28.3 | 3.36 |
| Brantley | Georgia | 3516 | 30 | 231 | 215 | 20 | 24 | 43.7 | 5.20 |
| Brooks | Georgia | 3325 | 28 | 83 | 67 | 20 | 7 | 27.4 | 3.26 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 1458 | 12 | 130 | 92 | 20 | 10 | 30.1 | 3.59 |
| Camden | Georgia | 11432 | 96 | 208 | 214 | 20 | 24 | 43.5 | 5.18 |
| Charlton | Georgia | 2292 | 19 | 200 | 192 | 20 | 21 | 41.1 | 4.90 |
| Clinch | Georgia | 1438 | 12 | 142 | 121 | 20 | 13 | 33.3 | 3.97 |
| Colquitt | Georgia | 8980 | 75 | 90 | 66 | 20 | 7 | 27.3 | 3.25 |
| Cook | Georgia | 3425 | 29 | 119 | 83 | 20 | 9 | 29.1 | 3.47 |
| Decatur | Georgia | 5862 | 49 | 52 | 42 | 20 | 5 | 24.6 | 2.93 |
| Dougherty | Georgia | 18549 | 156 | 133 | 92 | 20 | 10 | 30.1 | 3.59 |
| Early | Georgia | 2452 | 21 | 95 | 81 | 20 | 9 | 28.9 | 3.44 |
| Echols | Georgia | 1094 | 9 | 130 | 114 | 20 | 13 | 32.5 | 3.87 |
| Glynn | Georgia | 13780 | 116 | 217 | 239 | 20 | 26 | 46.3 | 5.51 |
| Grady | Georgia | 5119 | 43 | 55 | 32 | 20 | 4 | 23.5 | 2.80 |
| Lanier | Georgia | 1727 | 15 | 101 | 85 | 20 | 9 | 29.4 | 3.49 |
| Lowndes | Georgia | 20565 | 173 | 101 | 79 | 20 | 9 | 28.7 | 3.42 |
| McIntosh | Georgia | 2496 | 21 | 247 | 263 | 20 | 29 | 48.9 | 5.83 |
| Miller | Georgia | 1244 | 10 | 96 | 67 | 20 | 7 | 27.4 | 3.26 |
| Mitchell | Georgia | 5227 | 44 | 94 | 63 | 20 | 7 | 26.9 | 3.21 |
| Pierce | Georgia | 3398 | 29 | 189 | 155 | 20 | 17 | 37.1 | 4.41 |
| Seminole | Georgia | 1857 | 16 | 96 | 67 | 20 | 7 | 27.4 | 3.26 |
| Thomas | Georgia | 8815 | 74 | 55 | 41 | 20 | 5 | 24.5 | 2.92 |
| Ware | Georgia | 6840 | 57 | 199 | 192 | 20 | 21 | 41.1 | 4.90 |
| Wayne | Georgia | 5834 | 49 | 241 | 186 | 20 | 20 | 40.5 | 4.82 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 4579 | 38 | 90 | 65 | 20 | 7 | 27.2 | 3.23 |
| Henry | Alabama | 1253 | 11 | 115 | 112 | 20 | 12 | 32.3 | 3.85 |
| Houston | Alabama | 1479 | 12 | 96 | 71 | 20 | 8 | 27.8 | 3.31 |
| Geneva | Alabama | 8050 | 68 | 90 | 110 | 20 | 12 | 32.1 | 3.82 |

Table 6-6. Delivered cost for yard waste used as a fuel source for the GRU Deerhaven facility (within 2-hour travel time).

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29255 | 246 | 18 | 9.2 | 20 | 1 | 21.0 | 2.50 |
| Baker | Florida | 3708 | 31 | 67 | 55 | 20 | 6 | 26.1 | 3.10 |
| Bradford | Florida | 4637 | 39 | 51 | 37 | 20 | 4 | 24.1 | 2.87 |
| Citrus | Florida | 43267 | 363 | 95 | 79 | 20 | 9 | 28.7 | 3.42 |
| Clay | Florida | 20930 | 176 | 78 | 60 | 20 | 7 | 26.6 | 3.17 |
| Columbia | Florida | 2647 | 22 | 52 | 51 | 20 | 6 | 25.6 | 3.05 |
| Dixie | Florida | 807 | 7 | 52 | 44 | 20 | 5 | 24.8 | 2.96 |
| Duval | Florida | 150575 | 1265 | 76 | 63 | 20 | 7 | 26.9 | 3.21 |
| Gilchrist | Florida | 161 | 1 | 49 | 35 | 20 | 4 | 23.9 | 2.84 |
| Hamilton | Florida | 1145 | 10 | 68 | 67 | 20 | 7 | 27.4 | 3.26 |
| Hernando | Florida | 23414 | 197 | 119 | 109 | 20 | 12 | 32.0 | 3.81 |
| Jefferson | Florida | 927 | 8 | 95 | 105 | 20 | 12 | 31.6 | 3.76 |
| Lafayette | Florida | 92 | 1 | 83 | 60 | 20 | 7 | 26.6 | 3.17 |
| Lake | Florida | 32652 | 274 | 99 | 99 | 20 | 11 | 30.9 | 3.68 |
| Madison | Florida | 1672 | 14 | 95 | 105 | 20 | 12 | 31.6 | 3.76 |
| Marion | Florida | 39383 | 331 | 68 | 58 | 20 | 6 | 26.4 | 3.14 |
| Nassau | Florida | 633 | 5 | 103 | 79 | 20 | 9 | 28.7 | 3.42 |
| Putnam | Florida | 12254 | 103 | 72 | 56 | 20 | 6 | 26.2 | 3.11 |
| St. Johns | Florida | 27573 | 232 | 112 | 85 | 20 | 9 | 29.4 | 3.49 |
| Sumter | Florida | 6284 | 53 | 79 | 80 | 20 | 9 | 28.8 | 3.43 |
| Suwannee | Florida | 2693 | 23 | 63 | 66 | 20 | 7 | 27.3 | 3.25 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Taylor | Florida | 1640 | 14 | 105 | 93 | 20 | 10 | 30.2 | 3.60 |
| Union | Florida | 2103 | 18 | 62 | 47 | 20 | 5 | 25.2 | 3.00 |
| Volusia | Florida | 139657 | 1173 | 120 | 111 | 20 | 12 | 32.2 | 3.83 |
| Brooks | Georgia | 3325 | 28 | 109 | 116 | 20 | 13 | 32.8 | 3.90 |
| Cook | Georgia | 3425 | 29 | 112 | 121 | 20 | 13 | 33.3 | 3.97 |
| Echols | Georgia | 1094 | 9 | 100 | 90 | 20 | 10 | 29.9 | 3.56 |
| Lanier | Georgia | 1727 | 15 | 91 | 99 | 20 | 11 | 30.9 | 3.68 |
| Lowndes | Georgia | 20565 | 173 | 96 | 100 | 20 | 11 | 31.0 | 3.69 |

Table 6-7. Delivered cost for yard waste used as a fuel source for the GRU Deerhaven facility (within 2-hour travel time with competing demand).

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29255 | 246 | 18 | 9.2 | 20 | 1 | 21.0 | 2.50 |
| Citrus | Florida | 43267 | 363 | 95 | 79 | 20 | 9 | 28.7 | 3.42 |
| Dixie | Florida | 807 | 7 | 52 | 44 | 20 | 5 | 24.8 | 2.96 |
| Gilchrist | Florida | 161 | 1 | 49 | 35 | 20 | 4 | 23.9 | 2.84 |
| Hamilton | Florida | 1145 | 10 | 68 | 67 | 20 | 7 | 27.4 | 3.26 |
| Hernando | Florida | 23414 | 197 | 119 | 109 | 20 | 12 | 32.0 | 3.81 |
| Lafayette | Florida | 92 | 1 | 83 | 60 | 20 | 7 | 26.6 | 3.17 |
| Lake | Florida | 32652 | 274 | 99 | 99 | 20 | 11 | 30.9 | 3.68 |
| Marion | Florida | 39383 | 331 | 68 | 58 | 20 | 6 | 26.4 | 3.14 |
| Putnam | Florida | 12254 | 103 | 72 | 56 | 20 | 6 | 26.2 | 3.11 |
| Sumter | Florida | 6284 | 53 | 79 | 80 | 20 | 9 | 28.8 | 3.43 |
| Suwannee | Florida | 2693 | 23 | 63 | 66 | 20 | 7 | 27.3 | 3.25 |
| Cook | Georgia | 3425 | 29 | 112 | 121 | 20 | 13 | 33.3 | 3.97 |
| Lanier | Georgia | 1727 | 15 | 91 | 99 | 20 | 11 | 30.9 | 3.68 |
| Lowndes | Georgia | 20565 | 173 | 96 | 100 | 20 | 11 | 31.0 | 3.69 |

Table 6-8. Delivered cost for yard waste used as a fuel source for the JAX Brandy Branch facility (within 2-hour travel time).

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 29255 | 246 | 69 | 53.5 | 20 | 6 | 25.9 | 1.85 |
| Baker | Florida | 3708 | 31 | 23 | 23 | 20 | 3 | 22.5 | 1.61 |
| Bradford | Florida | 4637 | 39 | 36 | 32 | 20 | 4 | 23.5 | 1.68 |
| Clay | Florida | 20930 | 176 | 50 | 44 | 20 | 5 | 24.8 | 1.77 |
| Columbia | Florida | 2647 | 22 | 50 | 48 | 20 | 5 | 25.3 | 1.81 |
| Duval | Florida | 150575 | 1265 | 8 | 8 | 20 | 1 | 20.9 | 1.49 |
| Flagler | Florida | 21000 | 176 | 96 | 87 | 20 | 10 | 29.6 | 2.11 |
| Gilchrist | Florida | 161 | 1 | 100 | 100 | 20 | 11 | 31.0 | 2.21 |
| Hamilton | Florida | 1145 | 10 | 76 | 73 | 20 | 8 | 28.0 | 2.00 |
| Jefferson | Florida | 927 | 8 | 98 | 110 | 20 | 12 | 32.1 | 2.29 |
| Lafayette | Florida | 92 | 1 | 105 | 96 | 20 | 11 | 30.6 | 2.18 |
| Madison | Florida | 1672 | 14 | 98 | 110 | 20 | 12 | 32.1 | 2.29 |
| Marion | Florida | 39383 | 331 | 117 | 92 | 20 | 10 | 30.1 | 2.15 |
| Nassau | Florida | 633 | 5 | 33 | 25 | 20 | 3 | 22.8 | 1.63 |
| Putnam | Florida | 12254 | 103 | 85 | 67 | 20 | 7 | 27.4 | 1.96 |
| St. Johns | Florida | 27573 | 232 | 67 | 65 | 20 | 7 | 27.2 | 1.94 |
| Suwannee | Florida | 2693 | 23 | 66 | 71 | 20 | 8 | 27.8 | 1.99 |
| Union | Florida | 2103 | 18 | 34 | 28 | 20 | 3 | 23.1 | 1.65 |
| Volusia | Florida | 139657 | 1173 | 101 | 112 | 20 | 12 | 32.3 | 2.31 |
| Brantley | Georgia | 3516 | 30 | 94 | 71 | 20 | 8 | 27.8 | 1.99 |
| Brooks | Georgia | 3325 | 28 | 112 | 120 | 20 | 13 | 33.2 | 2.37 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Camden | Georgia | 11432 | 96 | 70 | 60 | 20 | 7 | 26.6 | 1.90 |
| Charlton | Georgia | 2292 | 19 | 69 | 50 | 20 | 6 | 25.5 | 1.82 |
| Clinch | Georgia | 1438 | 12 | 113 | 88 | 20 | 10 | 29.7 | 2.12 |
| Cook | Georgia | 3425 | 29 | 118 | 127 | 20 | 14 | 34.0 | 2.43 |
| Echols | Georgia | 1094 | 9 | 93 | 78 | 20 | 9 | 28.6 | 2.04 |
| Glynn | Georgia | 13780 | 116 | 86 | 91 | 20 | 10 | 30.0 | 2.14 |
| Lanier | Georgia | 1727 | 15 | 94 | 104 | 20 | 11 | 31.4 | 2.25 |
| Lowndes | Georgia | 20565 | 173 | 102 | 106 | 20 | 12 | 31.7 | 2.26 |
| McIntosh | Georgia | 2496 | 21 | 109 | 108 | 20 | 12 | 31.9 | 2.28 |
| Pierce | Georgia | 3398 | 29 | 107 | 92 | 20 | 10 | 30.1 | 2.15 |
| Ware | Georgia | 6840 | 57 | 69 | 50 | 20 | 6 | 25.5 | 1.82 |

Table 6-9. Delivered cost for yard waste used as a fuel source for the JEA Brandy Branch facility (within 2-hour travel time with competing demand).

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Baker | Florida | 3708 | 31 | 23 | 23 | 20 | 3 | 22.5 | 1.61 |
| Bradford | Florida | 4637 | 39 | 36 | 32 | 20 | 4 | 23.5 | 1.68 |
| Clay | Florida | 20930 | 176 | 50 | 44 | 20 | 5 | 24.8 | 1.77 |
| Columbia | Florida | 2647 | 22 | 50 | 48 | 20 | 5 | 25.3 | 1.81 |
| Duval | Florida | 150575 | 1265 | 8 | 8 | 20 | 1 | 20.9 | 1.49 |
| Flagler | Florida | 21000 | 176 | 96 | 87 | 20 | 10 | 29.6 | 2.11 |
| Nassau | Florida | 633 | 5 | 33 | 25 | 20 | 3 | 22.8 | 1.63 |
| St. Johns | Florida | 27573 | 232 | 67 | 65 | 20 | 7 | 27.2 | 1.94 |
| Union | Florida | 2103 | 18 | 34 | 28 | 20 | 3 | 23.1 | 1.65 |
| Volusia | Florida | 139657 | 1173 | 101 | 112 | 20 | 12 | 32.3 | 2.31 |
| Brantley | Georgia | 3516 | 30 | 94 | 71 | 20 | 8 | 27.8 | 1.99 |
| Camden | Georgia | 11432 | 96 | 70 | 60 | 20 | 7 | 26.6 | 1.90 |
| Charlton | Georgia | 2292 | 19 | 69 | 50 | 20 | 6 | 25.5 | 1.82 |
| Clinch | Georgia | 1438 | 12 | 113 | 88 | 20 | 10 | 29.7 | 2.12 |
| Echols | Georgia | 1094 | 9 | 93 | 78 | 20 | 9 | 28.6 | 2.04 |
| Glynn | Georgia | 13780 | 116 | 86 | 91 | 20 | 10 | 30.0 | 2.14 |
| McIntosh | Georgia | 2496 | 21 | 109 | 108 | 20 | 12 | 31.9 | 2.28 |
| Pierce | Georgia | 3398 | 29 | 107 | 92 | 20 | 10 | 30.1 | 2.15 |
| Ware | Georgia | 6840 | 57 | 69 | 50 | 20 | 6 | 25.5 | 1.82 |

Table 6-10. Delivered cost for yard waste used as a fuel source for the TAL Hopkins facility (within 2-hour travel time).

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 359 | 3 | 9 | 4 | 20 | 0 | 20.4 | 2.43 |
| Columbia | Florida | 2647 | 22 | 108 | 112 | 20 | 12 | 32.3 | 3.85 |
| Dixie | Florida | 807 | 7 | 118 | 114 | 20 | 13 | 32.5 | 3.87 |
| Franklin | Florida | 2702 | 23 | 99 | 72 | 20 | 8 | 27.9 | 3.32 |
| Gadsden | Florida | 5269 | 44 | 31 | 24 | 20 | 3 | 22.6 | 2.70 |
| Hamilton | Florida | 1145 | 10 | 110 | 106 | 20 | 12 | 31.7 | 3.77 |
| Holmes | Florida | 394 | 3 | 66 | 91 | 20 | 10 | 30.0 | 3.57 |
| Jackson | Florida | 4258 | 36 | 90 | 86 | 20 | 9 | 29.5 | 3.51 |
| Jefferson | Florida | 927 | 8 | 52 | 53 | 20 | 6 | 25.8 | 3.08 |
| Lafayette | Florida | 92 | 1 | 111 | 102 | 20 | 11 | 31.2 | 3.72 |
| Leon | Florida | 17942 | 151 | 23 | 11 | 20 | 1 | 21.2 | 2.53 |
| Liberty | Florida | 169 | 1 | 46 | 33 | 20 | 4 | 23.6 | 2.81 |
| Madison | Florida | 1672 | 14 | 52 | 53 | 20 | 6 | 25.8 | 3.08 |
| Suwannee | Florida | 2693 | 23 | 91 | 97 | 20 | 11 | 30.7 | 3.65 |
| Taylor | Florida | 1640 | 14 | 73 | 71 | 20 | 8 | 27.8 | 3.31 |
| Wakulla | Florida | 127 | 1 | 33 | 24 | 20 | 3 | 22.6 | 2.70 |
| Walton | Florida | 1592 | 13 | 117 | 124 | 20 | 14 | 33.6 | 4.00 |
| Washington | Florida | 671 | 6 | 83 | 86 | 20 | 9 | 29.5 | 3.51 |
| Baker | Georgia | 858 | 7 | 97 | 75 | 20 | 8 | 28.3 | 3.36 |
| Brooks | Georgia | 3325 | 28 | 83 | 67 | 20 | 7 | 27.4 | 3.26 |
| Colquitt | Georgia | 8980 | 75 | 90 | 66 | 20 | 7 | 27.3 | 3.25 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Cook | Georgia | 3425 | 29 | 119 | 83 | 20 | 9 | 29.1 | 3.47 |
| Decatur | Georgia | 5862 | 49 | 52 | 42 | 20 | 5 | 24.6 | 2.93 |
| Early | Georgia | 2452 | 21 | 95 | 81 | 20 | 9 | 28.9 | 3.44 |
| Grady | Georgia | 5119 | 43 | 55 | 32 | 20 | 4 | 23.5 | 2.80 |
| Lanier | Georgia | 1727 | 15 | 101 | 85 | 20 | 9 | 29.4 | 3.49 |
| Lowndes | Georgia | 20565 | 173 | 101 | 79 | 20 | 9 | 28.7 | 3.42 |
| Miller | Georgia | 1244 | 10 | 96 | 67 | 20 | 7 | 27.4 | 3.26 |
| Mitchell | Georgia | 5227 | 44 | 94 | 63 | 20 | 7 | 26.9 | 3.21 |
| Seminole | Georgia | 1857 | 16 | 96 | 67 | 20 | 7 | 27.4 | 3.26 |
| Thomas | Georgia | 8815 | 74 | 55 | 41 | 20 | 5 | 24.5 | 2.92 |
| Worth | Georgia | 4579 | 38 | 90 | 65 | 20 | 7 | 27.2 | 3.23 |
| Henry | Alabama | 1253 | 11 | 115 | 112 | 20 | 12 | 32.3 | 3.85 |
| Houston | Alabama | 1479 | 12 | 96 | 71 | 20 | 8 | 27.8 | 3.31 |
| Geneva | Alabama | 8050 | 68 | 90 | 110 | 20 | 12 | 32.1 | 3.82 |

Table 6-11. Delivered cost for yard waste used as a fuel source for the TAL Hopkins facility (within 2-hour travel time with competing demand).

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 359 | 3 | 9 | 4 | 20 | 0 | 20.4 | 2.43 |
| Franklin | Florida | 2702 | 23 | 99 | 72 | 20 | 8 | 27.9 | 3.32 |
| Gadsden | Florida | 5269 | 44 | 31 | 24 | 20 | 3 | 22.6 | 2.70 |
| Holmes | Florida | 394 | 3 | 66 | 91 | 20 | 10 | 30.0 | 3.57 |
| Jackson | Florida | 4258 | 36 | 90 | 86 | 20 | 9 | 29.5 | 3.51 |
| Jefferson | Florida | 927 | 8 | 52 | 53 | 20 | 6 | 25.8 | 3.08 |
| Lafayette | Florida | 92 | 1 | 111 | 102 | 20 | 11 | 31.2 | 3.72 |
| Leon | Florida | 17942 | 151 | 23 | 11 | 20 | 1 | 21.2 | 2.53 |
| Liberty | Florida | 169 | 1 | 46 | 33 | 20 | 4 | 23.6 | 2.81 |
| Madison | Florida | 1672 | 14 | 52 | 53 | 20 | 6 | 25.8 | 3.08 |
| Taylor | Florida | 1640 | 14 | 73 | 71 | 20 | 8 | 27.8 | 3.31 |
| Wakulla | Florida | 127 | 1 | 33 | 24 | 20 | 3 | 22.6 | 2.70 |
| Walton | Florida | 1592 | 13 | 117 | 124 | 20 | 14 | 33.6 | 4.00 |
| Washington | Florida | 671 | 6 | 83 | 86 | 20 | 9 | 29.5 | 3.51 |
| Baker | Georgia | 858 | 7 | 97 | 75 | 20 | 8 | 28.3 | 3.36 |
| Brooks | Georgia | 3325 | 28 | 83 | 67 | 20 | 7 | 27.4 | 3.26 |
| Colquitt | Georgia | 8980 | 75 | 90 | 66 | 20 | 7 | 27.3 | 3.25 |
| Decatur | Georgia | 5862 | 49 | 52 | 42 | 20 | 5 | 24.6 | 2.93 |
| Early | Georgia | 2452 | 21 | 95 | 81 | 20 | 9 | 28.9 | 3.44 |
| Grady | Georgia | 5119 | 43 | 55 | 32 | 20 | 4 | 23.5 | 2.80 |
| Miller | Georgia | 1244 | 10 | 96 | 67 | 20 | 7 | 27.4 | 3.26 |

| County | State | Yard Waste (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Mitchell | Georgia | 5227 | 44 | 94 | 63 | 20 | 7 | 26.9 | 3.21 |
| Seminole | Georgia | 1857 | 16 | 96 | 67 | 20 | 7 | 27.4 | 3.26 |
| Thomas | Georgia | 8815 | 74 | 55 | 41 | 20 | 5 | 24.5 | 2.92 |
| Worth | Georgia | 4579 | 38 | 90 | 65 | 20 | 7 | 27.2 | 3.23 |
| Henry | Alabama | 1253 | 11 | 115 | 112 | 20 | 12 | 32.3 | 3.85 |
| Houston | Alabama | 1479 | 12 | 96 | 71 | 20 | 8 | 27.8 | 3.31 |
| Geneva | Alabama | 8050 | 68 | 90 | 110 | 20 | 12 | 32.1 | 3.82 |

# 7. TIRES

## 7.1. Fuel Description

Tires can be used as fuel alternatives. Combustion facilities currently using tires as fuel include: (1) power plants; (2) tire manufacturing plants; (3) cement kilns; (4) pulp and paper plants; and (5) small package steam generators. In order to prevent discarded automobile tires from damaging the environment, it is highly desirable to recycle this material. However, the total mass quantity of tires currently recycled in a given year (not including reuse, retreading, or combustion) is less than 7% of the annual tire generation rate. The number of tires produced each year would continue to far exceed the demand for scrap and used tires. Only a small portion of waste tires are retreaded, and a very small portion is devulcanized by tedious processes. Tires that are not recycled or reused are usually shredded and disposed of in landfills, or stockpiled whole. Stockpiling whole tires creates two significant hazards, mosquitoes and fires.

In addition to fuel alternatives, pyrolysis of tires can be performed to chemically alter the materials of the tire or to derive various products such as carbon black. Burning tires whole obviates the need for expensive shredding operations. However, the burning of whole tires requires a relatively sophisticated high temperature combustion facility to keep emissions within environmental limits. It also requires equipment capable of handling the whole tires and feeding them into the combustion chamber. Most plants currently burning tires for fuel, excluding cement kilns, do not have the capability to burn whole tires. Instead the tires are shredded into chunks ranging from 2 to 6 inches in size prior to being introduced as a fuel. Typically, rubber chunks contain steel wire from the tire beads and steel belts. If the combustion process requires removal of the wire, the cost for combustion is increased. The wire removal from rubber chunks is an expensive process, which requires fine shredding and the use of powerful magnets.

## 7.2. Current Management

Before the Florida waste tire management program was implemented in 1989, almost all waste tires in the state were either landfilled or stockpiled. Starting in 1989, tires had to be cut or shredded in at least 8 pieces prior to landfill disposal, thereby encouraging the development of alternative uses. Table 7-1 presents some of the potential constructive uses as per the particle size of shredded tires.

Table 7-1. Waste tire usage in different applications based on particle size.

| Particle Size | Applications |
|---|---|
| Whole Tire: | Artificial reefs and breakwaters |
| | Playground equipment |
| | Erosion control |
| | Highway crash barriers |
| Split or Punched Tire: | Gaskets, seals, washers, shims, and insulators |
| | Floor mats, belts and shoe soles |
| | Dock bumpers |
| | Muffler hangers |
| Shredded Tire: | Lightweight road construction material |
| | Playground gravel substitutes |
| | Sludge composting |
| Ground Rubber: | Rubber and plastic products (e.g., molded floor mats, mud guards, carpet padding, and plastic adhesives) |
| | Rubber railroad crossings |
| | Additives for asphalt pavements |

In 2006, 86% of waste tires produced in Florida were constructively utilized. Potential uses include asphalt modification, playground/sports surfacing, soil covers and incineration, among others. Table 7-2 presents a table from a recently published FDEP document on waste tire usage in Florida (FDEP, 2007).

Table 7-2. Year 2006 estimated waste tire usage in Florida (in PTEs[1]).

| Market | 2006 usage of waste tires generated in Florida (PTE) | Applications |
|---|---|---|
| Export of used tires | 250,000 | Primarily to Caribbean/Latin countries |
| Crumb Rubber Applications | | |
| Highway Uses | 870,000 | Rubberized asphalt, crack sealant |
| Playground/sports safety surfaces | 860,000 | Cushioning material |
| On-ground Uses | 2,400,000 | Soil amendments and mulch |
| Molded Products | 1,000,000 | Mats, tiles, outdoor tables |
| Subtotal-Crumb Rubber | 5,130,000 | |
| Energy Use | | |
| In-State Industrial TDF | 5,270,000 | Includes Ridge Generating, Rinker Cemex and Florida Rock |
| In-State WTE facility | 1,850,000 | Supplemental energy use by 6 facilities |
| Out of state TDF | 4,200,000 | Paper/cement in Georgia and Alabama |
| Subtotal-TDF | 11,320,000 | |
| Civil Engineering | | |
| Drain field aggregate | 330,000 | Replaces rock/ aggregate |
| Landfill daily cover | 490,000 | Displaces soil |
| Other CE uses | 1,170,000 | Drainage layer, gas collection, leachate injection trenches |
| Subtotal CE | 1,990,000 | |
| Disposal | 3,060,000 | Landfill disposal of shredded tires (including >2 million in Dade County) |
| Total | 21,500,000 | |

[1] A 20 pound passenger tire is 1 PTE; a 100 pound truck tire is 5 PTEs.

### 7.3. Waste Projection

For the projections of waste tires in the area, the quantity of waste tires was calculated using the values reported by the various counties for its generation. The amount of waste tires produced at different counties within the study region was projected using the projected population data and rate of waste tire production (Table 7-3).

Table 7-3. County level waste tire projections (in tons) for the next 5 years.

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4,876 | 4,953 | 5,028 | 5,101 | 5,178 | 5,254 |
| Baker | Florida | 390 | 397 | 404 | 412 | 417 | 423 |
| Bay | Florida | 4,338 | 4,409 | 4,475 | 4,540 | 4,606 | 4,671 |
| Bradford | Florida | 258 | 261 | 263 | 266 | 268 | 271 |
| Calhoun | Florida | 574 | 581 | 585 | 590 | 596 | 603 |
| Citrus | Florida | 2,704 | 2,761 | 2,815 | 2,868 | 2,923 | 2,977 |
| Clay | Florida | 3,488 | 3,596 | 3,701 | 3,805 | 3,908 | 4,010 |
| Columbia | Florida | 1,765 | 1,805 | 1,846 | 1,887 | 1,919 | 1,951 |
| Dixie | Florida | 161 | 165 | 167 | 170 | 173 | 176 |
| Duval | Florida | 13,689 | 13,906 | 14,116 | 14,322 | 14,538 | 14,752 |
| Flagler | Florida | 4,200 | 4,417 | 4,601 | 4,766 | 4,990 | 5,211 |
| Franklin | Florida | 129 | 134 | 139 | 144 | 146 | 148 |
| Gadsden | Florida | 479 | 483 | 487 | 490 | 494 | 497 |
| Gilchrist | Florida | 161 | 166 | 171 | 176 | 180 | 184 |
| Gulf | Florida | 280 | 283 | 285 | 288 | 290 | 293 |
| Hamilton | Florida | 88 | 89 | 90 | 91 | 91 | 92 |
| Hernando | Florida | 2,341 | 2,395 | 2,445 | 2,491 | 2,545 | 2,599 |
| Holmes | Florida | 315 | 318 | 321 | 323 | 325 | 328 |
| Jackson | Florida | 1,161 | 1,178 | 1,193 | 1,206 | 1,217 | 1,227 |
| Jefferson | Florida | 265 | 268 | 270 | 273 | 275 | 278 |
| Lafayette | Florida | 153 | 154 | 154 | 153 | 155 | 156 |
| Lake | Florida | 7,256 | 7,511 | 7,758 | 8,001 | 8,246 | 8,489 |
| Leon | Florida | 8,971 | 9,126 | 9,268 | 9,403 | 9,565 | 9,725 |
| Levy | Florida | 258 | 264 | 271 | 277 | 283 | 288 |
| Liberty | Florida | 34 | 34 | 34 | 34 | 35 | 35 |
| Madison | Florida | 372 | 375 | 378 | 382 | 385 | 388 |
| Marion | Florida | 3,282 | 3,373 | 3,459 | 3,542 | 3,630 | 3,717 |
| Nassau | Florida | 1,265 | 1,301 | 1,340 | 1,381 | 1,413 | 1,444 |
| Orange | Florida | 42,856 | 44,063 | 45,271 | 46,472 | 47,613 | 48,738 |
| Pasco | Florida | 14,048 | 14,399 | 14,714 | 15,010 | 15,368 | 15,721 |
| Putnam | Florida | 817 | 824 | 831 | 838 | 845 | 852 |
| St. Johns | Florida | 4,242 | 4,405 | 4,562 | 4,715 | 4,874 | 5,031 |
| Sumter | Florida | 1,396 | 1,451 | 1,493 | 1,528 | 1,586 | 1,643 |
| Suwannee | Florida | 539 | 550 | 562 | 575 | 586 | 596 |
| Taylor | Florida | 219 | 222 | 225 | 229 | 232 | 236 |
| Union | Florida | 234 | 237 | 240 | 243 | 246 | 248 |
| Volusia | Florida | 19,951 | 20,342 | 20,728 | 21,109 | 21,480 | 21,845 |
| Wakulla | Florida | 636 | 665 | 691 | 716 | 736 | 755 |
| Walton | Florida | 3,185 | 3,235 | 3,284 | 3,332 | 3,382 | 3,432 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Washington | Florida | 168 | 173 | 177 | 182 | 185 | 187 |
| Baker | Georgia | 143 | 145 | 147 | 148 | 150 | 152 |
| Brantley | Georgia | 586 | 605 | 624 | 644 | 665 | 686 |
| Brooks | Georgia | 554 | 558 | 562 | 566 | 569 | 573 |
| Calhoun | Georgia | 243 | 249 | 256 | 263 | 269 | 276 |
| Camden | Georgia | 1,905 | 1,991 | 2,080 | 2,173 | 2,270 | 2,371 |
| Charlton | Georgia | 382 | 390 | 398 | 407 | 415 | 424 |
| Clinch | Georgia | 240 | 242 | 245 | 248 | 251 | 254 |
| Colquitt | Georgia | 1,497 | 1,519 | 1,541 | 1,564 | 1,587 | 1,610 |
| Cook | Georgia | 571 | 581 | 591 | 601 | 611 | 622 |
| Decatur | Georgia | 977 | 987 | 998 | 1,009 | 1,019 | 1,030 |
| Dougherty | Georgia | 3,091 | 3,092 | 3,093 | 3,094 | 3,095 | 3,096 |
| Early | Georgia | 409 | 410 | 412 | 414 | 416 | 417 |
| Echols | Georgia | 182 | 193 | 205 | 218 | 231 | 245 |
| Glynn | Georgia | 2,297 | 2,315 | 2,334 | 2,353 | 2,372 | 2,391 |
| Grady | Georgia | 853 | 867 | 882 | 897 | 911 | 927 |
| Lanier | Georgia | 288 | 297 | 306 | 315 | 325 | 335 |
| Lowndes | Georgia | 3,428 | 3,500 | 3,575 | 3,651 | 3,728 | 3,807 |
| McIntosh | Georgia | 416 | 427 | 438 | 449 | 460 | 472 |
| Miller | Georgia | 207 | 208 | 208 | 208 | 209 | 209 |
| Mitchell | Georgia | 871 | 887 | 903 | 919 | 936 | 953 |
| Pierce | Georgia | 566 | 576 | 586 | 596 | 607 | 617 |
| Seminole | Georgia | 309 | 311 | 312 | 313 | 314 | 316 |
| Thomas | Georgia | 1,469 | 1,483 | 1,498 | 1,512 | 1,527 | 1,542 |
| Ware | Georgia | 1,140 | 1,140 | 1,140 | 1,140 | 1,140 | 1,140 |
| Wayne | Georgia | 972 | 991 | 1,009 | 1,028 | 1,048 | 1,067 |
| Worth | Georgia | 763 | 772 | 780 | 789 | 798 | 807 |
| Henry | Alabama | 209 | 211 | 214 | 217 | 220 | 222 |
| Houston | Alabama | 246 | 250 | 253 | 256 | 259 | 263 |
| Geneva | Alabama | 1,342 | 1,344 | 1,361 | 1,377 | 1,396 | 1,413 |

Table 7-4 presents the energy value of the waste tire projections in potential Btu of energy if all these waste tires are used as fuel. A value of 14,000 Btu/lb was used for the energy conversion. This value is the average heat value from the two studies related to wood combustion as presented in the previous chapter.

Table 7-4. County level waste tire projections (in billion Btu) for the next 5 years.

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Alachua | Florida | 137.0 | 139.0 | 141.0 | 143.0 | 145.0 | 147.0 |
| Baker | Florida | 11.0 | 11.0 | 11.0 | 12.0 | 12.0 | 12.0 |
| Bay | Florida | 121.0 | 123.0 | 125.0 | 127.0 | 129.0 | 131.0 |
| Bradford | Florida | 7.2 | 7.3 | 7.4 | 7.4 | 7.5 | 7.6 |
| Calhoun | Florida | 16.0 | 16.0 | 16.0 | 17.0 | 17.0 | 17.0 |
| Citrus | Florida | 76.0 | 77.0 | 79.0 | 80.0 | 82.0 | 83.0 |
| Clay | Florida | 98.0 | 101.0 | 104.0 | 107.0 | 109.0 | 112.0 |
| Columbia | Florida | 49.0 | 51.0 | 52.0 | 53.0 | 54.0 | 55.0 |
| Dixie | Florida | 4.5 | 4.6 | 4.7 | 4.8 | 4.8 | 4.9 |
| Duval | Florida | 383.3 | 389.4 | 395.2 | 401.0 | 407.1 | 413.0 |
| Flagler | Florida | 118.0 | 124.0 | 129.0 | 133.0 | 140.0 | 146.0 |
| Franklin | Florida | 3.6 | 3.7 | 3.9 | 4.0 | 4.1 | 4.1 |
| Gadsden | Florida | 13.0 | 14.0 | 14.0 | 14.0 | 14.0 | 14.0 |
| Gilchrist | Florida | 4.5 | 4.6 | 4.8 | 4.9 | 5.0 | 5.1 |
| Gulf | Florida | 7.8 | 7.9 | 8.0 | 8.1 | 8.1 | 8.2 |
| Hamilton | Florida | 2.5 | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 |
| Hernando | Florida | 66.0 | 67.0 | 68.0 | 70.0 | 71.0 | 73.0 |
| Holmes | Florida | 8.8 | 8.9 | 9.0 | 9.0 | 9.1 | 9.2 |
| Jackson | Florida | 33.0 | 33.0 | 33.0 | 34.0 | 34.0 | 34.0 |
| Jefferson | Florida | 7.4 | 7.5 | 7.6 | 7.6 | 7.7 | 7.8 |
| Lafayette | Florida | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 4.4 |
| Lake | Florida | 203.0 | 210.0 | 217.0 | 224.0 | 231.0 | 238.0 |
| Leon | Florida | 251.0 | 256.0 | 260.0 | 263.0 | 268.0 | 272.0 |
| Levy | Florida | 7.2 | 7.4 | 7.6 | 7.8 | 7.9 | 8.1 |
| Liberty | Florida | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Madison | Florida | 10.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 |
| Marion | Florida | 92.0 | 94.0 | 97.0 | 99.0 | 102.0 | 104.0 |
| Nassau | Florida | 35.0 | 36.0 | 38.0 | 39.0 | 40.0 | 40.0 |
| Orange | Florida | 1,200.0 | 1,234.0 | 1,268.0 | 1,301.0 | 1,333.0 | 1,365.0 |
| Pasco | Florida | 393.0 | 403.0 | 412.0 | 420.0 | 430.0 | 440.0 |
| Putnam | Florida | 23.0 | 23.0 | 23.0 | 23.0 | 24.0 | 24.0 |
| St. Johns | Florida | 119.0 | 123.0 | 128.0 | 132.0 | 136.0 | 141.0 |
| Sumter | Florida | 39.0 | 41.0 | 42.0 | 43.0 | 44.0 | 46.0 |
| Suwannee | Florida | 15.0 | 15.0 | 16.0 | 16.0 | 16.0 | 17.0 |
| Taylor | Florida | 6.0 | 6.0 | 6.0 | 6.0 | 7.0 | 7.0 |
| Union | Florida | 6.5 | 6.6 | 6.7 | 6.8 | 6.9 | 6.9 |
| Volusia | Florida | 559.0 | 570.0 | 580.0 | 591.0 | 601.0 | 612.0 |
| Wakulla | Florida | 18.0 | 19.0 | 19.0 | 20.0 | 21.0 | 21.0 |
| Walton | Florida | 89.0 | 91.0 | 92.0 | 93.0 | 95.0 | 96.0 |

| County | State | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|
| Washington | Florida | 4.7 | 4.8 | 5.0 | 5.1 | 5.2 | 5.2 |
| Baker | Georgia | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Brantley | Georgia | 16.0 | 17.0 | 17.0 | 18.0 | 19.0 | 19.0 |
| Brooks | Georgia | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 |
| Calhoun | Georgia | 7.0 | 7.0 | 7.0 | 7.0 | 8.0 | 8.0 |
| Camden | Georgia | 53.0 | 56.0 | 58.0 | 61.0 | 64.0 | 66.0 |
| Charlton | Georgia | 11.0 | 11.0 | 11.0 | 11.0 | 12.0 | 12.0 |
| Clinch | Georgia | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Colquitt | Georgia | 42.0 | 43.0 | 43.0 | 44.0 | 44.0 | 45.0 |
| Cook | Georgia | 16.0 | 16.0 | 17.0 | 17.0 | 17.0 | 17.0 |
| Decatur | Georgia | 27.0 | 28.0 | 28.0 | 28.0 | 29.0 | 29.0 |
| Dougherty | Georgia | 87.0 | 87.0 | 87.0 | 87.0 | 87.0 | 87.0 |
| Early | Georgia | 11.0 | 11.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Echols | Georgia | 5.0 | 5.0 | 6.0 | 6.0 | 6.0 | 7.0 |
| Glynn | Georgia | 64.0 | 65.0 | 65.0 | 66.0 | 66.0 | 67.0 |
| Grady | Georgia | 24.0 | 24.0 | 25.0 | 25.0 | 26.0 | 26.0 |
| Lanier | Georgia | 8.0 | 8.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| Lowndes | Georgia | 96.0 | 98.0 | 100.0 | 102.0 | 104.0 | 107.0 |
| McIntosh | Georgia | 12.0 | 12.0 | 12.0 | 13.0 | 13.0 | 13.0 |
| Miller | Georgia | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Mitchell | Georgia | 24.0 | 25.0 | 25.0 | 26.0 | 26.0 | 27.0 |
| Pierce | Georgia | 16.0 | 16.0 | 16.0 | 17.0 | 17.0 | 17.0 |
| Seminole | Georgia | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| Thomas | Georgia | 41.0 | 42.0 | 42.0 | 42.0 | 43.0 | 43.0 |
| Ware | Georgia | 32.0 | 32.0 | 32.0 | 32.0 | 32.0 | 32.0 |
| Wayne | Georgia | 27.0 | 28.0 | 28.0 | 29.0 | 29.0 | 30.0 |
| Worth | Georgia | 21.0 | 22.0 | 22.0 | 22.0 | 22.0 | 23.0 |
| Henry | Alabama | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Houston | Alabama | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Geneva | Alabama | 38.0 | 38.0 | 38.0 | 39.0 | 39.0 | 40.0 |

### 7.4. Feasibility Assessment

The processing cost of waste tires is approximately $50/ ton. The transportation cost was calculated based on the distance from the waste collection point in the county to the three power plant facilities. Tables 7-5 thru 7-7 presents the delivered cost per MMBtu for the waste tires as tire derived fuel (TDF) from the different counties to the three power generation units targeted in this study. The scenario of all the waste from a specific county being available for all the three

facilities is being presented (without competing demand between facilities). The cost calculations shown are only for the year 2007. The other two scenarios for the three facilities one considering two hour travel time from the waste collection center to the power plant (with no competing demand) and the other considering the 2-hour travel time with competing demand (and assuming that the waste goes to the nearest facility in case of two or more facilities being within a travel time range of 2-hour is presented for the three facilities in Table 7-8 thru 7-13. Similar calculations can be performed for other years. The major part of the cost is from the processing of waste before its use as fuel. As mentioned before in this document, the income from tipping fees has not been included in this calculation.

As of this date, one of the major consumers for the waste tires in the project region is Wheelabrator Ridge Energy, Inc. facility near Auburndale, in Polk County, Florida. Although Polk County is part of the project boundary, many counties as of this date have an agreement either directly or through another company with this facility. As part of this contract, the waste tires produced in these counties are sent to this facility for its use as fuel. Figure 7-1 shows the proximate location of the facility with an arrow from different counties converging to this incinerator. The counties from where arrows are originating have a contract to send all of their tires or part of this based on contract to this particular incinerator.

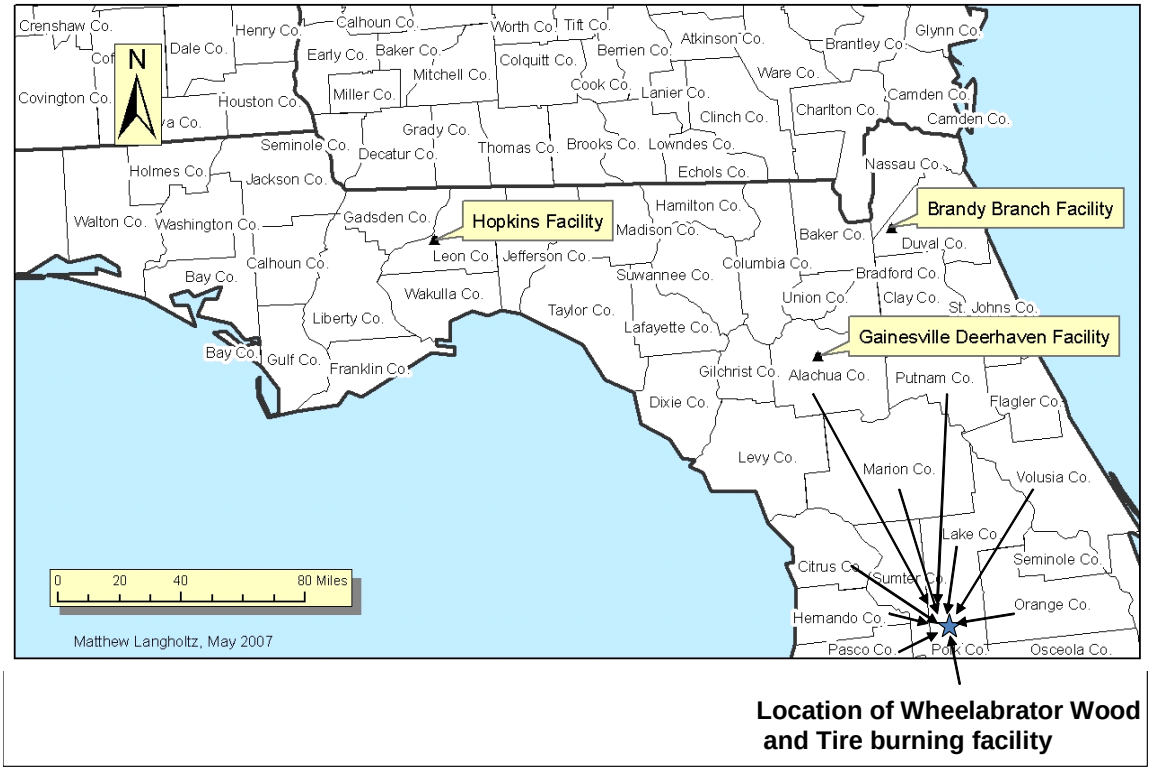


Figure 7-1. Counties sending their waste tires to the Wheelabrator facility in Winter Haven, Polk County, Florida.

Table 7-5. Delivered cost for waste tires used as a fuel source for the GRU Deerhaven facility.

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4876 | 137 | 18 | 9.2 | 50 | 1 | 51.0 | 1.82 |
| Baker | Florida | 390 | 11 | 67 | 55 | 50 | 6 | 56.1 | 2.00 |
| Bay | Florida | 4338 | 121 | 266 | 266 | 50 | 29 | 79.3 | 2.83 |
| Bradford | Florida | 258 | 7 | 51 | 37 | 50 | 4 | 54.1 | 1.93 |
| Calhoun | Florida | 574 | 16 | 174 | 149 | 50 | 16 | 66.4 | 2.37 |
| Citrus | Florida | 2704 | 76 | 95 | 79 | 50 | 9 | 58.7 | 2.10 |
| Clay | Florida | 3488 | 98 | 78 | 60 | 50 | 7 | 56.6 | 2.02 |
| Columbia | Florida | 1765 | 49 | 52 | 51 | 50 | 6 | 55.6 | 1.99 |
| Dixie | Florida | 161 | 5 | 52 | 44 | 50 | 5 | 54.8 | 1.96 |
| Duval | Florida | 13689 | 383 | 76 | 63 | 50 | 7 | 56.9 | 2.03 |
| Flagler | Florida | 4200 | 118 | 123 | 81 | 50 | 9 | 58.9 | 2.10 |
| Franklin | Florida | 129 | 4 | 222 | 208 | 50 | 23 | 72.9 | 2.60 |
| Gadsden | Florida | 479 | 13 | 152 | 167 | 50 | 18 | 68.4 | 2.44 |
| Gilchrist | Florida | 161 | 5 | 49 | 35 | 50 | 4 | 53.9 | 1.92 |
| Gulf | Florida | 280 | 8 | 255 | 243 | 50 | 27 | 76.7 | 2.74 |
| Hamilton | Florida | 88 | 2 | 68 | 67 | 50 | 7 | 57.4 | 2.05 |
| Hernando | Florida | 2341 | 66 | 119 | 109 | 50 | 12 | 62.0 | 2.21 |
| Holmes | Florida | 315 | 9 | 208 | 234 | 50 | 26 | 75.7 | 2.71 |
| Jackson | Florida | 1161 | 33 | 209 | 225 | 50 | 25 | 74.8 | 2.67 |
| Jefferson | Florida | 265 | 7 | 95 | 105 | 50 | 12 | 61.6 | 2.20 |
| Lafayette | Florida | 153 | 4 | 83 | 60 | 50 | 7 | 56.6 | 2.02 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 7256 | 203 | 99 | 99 | 50 | 11 | 60.9 | 2.17 |
| Leon | Florida | 8971 | 251 | 129 | 135 | 50 | 15 | 64.9 | 2.32 |
| Levy | Florida | 258 | 7 | 69 | 48 | 50 | 5 | 55.3 | 1.97 |
| Liberty | Florida | 34 | 1 | 173 | 185 | 50 | 20 | 70.4 | 2.51 |
| Madison | Florida | 372 | 10 | 95 | 105 | 50 | 12 | 61.6 | 2.20 |
| Marion | Florida | 3282 | 92 | 68 | 58 | 50 | 6 | 56.4 | 2.01 |
| Nassau | Florida | 1265 | 35 | 103 | 79 | 50 | 9 | 58.7 | 2.10 |
| Orange | Florida | 42856 | 1200 | 134 | 137 | 50 | 15 | 65.1 | 2.32 |
| Pasco | Florida | 14048 | 393 | 145 | 139 | 50 | 15 | 65.3 | 2.33 |
| Putnam | Florida | 817 | 23 | 72 | 56 | 50 | 6 | 56.2 | 2.01 |
| St. Johns | Florida | 4242 | 119 | 112 | 85 | 50 | 9 | 59.4 | 2.12 |
| Sumter | Florida | 1396 | 39 | 79 | 80 | 50 | 9 | 58.8 | 2.10 |
| Suwannee | Florida | 539 | 15 | 63 | 66 | 50 | 7 | 57.3 | 2.05 |
| Taylor | Florida | 219 | 6 | 105 | 93 | 50 | 10 | 60.2 | 2.15 |
| Union | Florida | 234 | 7 | 62 | 47 | 50 | 5 | 55.2 | 1.97 |
| Volusia | Florida | 19951 | 559 | 120 | 111 | 50 | 12 | 62.2 | 2.22 |
| Wakulla | Florida | 636 | 18 | 160 | 164 | 50 | 18 | 68.0 | 2.43 |
| Walton | Florida | 3185 | 89 | 240 | 267 | 50 | 29 | 79.4 | 2.83 |
| Washington | Florida | 168 | 5 | 205 | 229 | 50 | 25 | 75.2 | 2.69 |
| Baker | Georgia | 143 | 4 | 187 | 185 | 50 | 20 | 70.4 | 2.51 |
| Brantley | Georgia | 586 | 16 | 163 | 119 | 50 | 13 | 63.1 | 2.25 |
| Brooks | Georgia | 554 | 16 | 109 | 116 | 50 | 13 | 62.8 | 2.24 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 243 | 7 | 228 | 214 | 50 | 24 | 73.5 | 2.63 |
| Camden | Georgia | 1905 | 53 | 135 | 116 | 50 | 13 | 62.8 | 2.24 |
| Charlton | Georgia | 382 | 11 | 131 | 97 | 50 | 11 | 60.7 | 2.17 |
| Clinch | Georgia | 240 | 7 | 133 | 135 | 50 | 15 | 64.9 | 2.32 |
| Colquitt | Georgia | 1497 | 42 | 150 | 141 | 50 | 16 | 65.5 | 2.34 |
| Cook | Georgia | 571 | 16 | 112 | 121 | 50 | 13 | 63.3 | 2.26 |
| Decatur | Georgia | 977 | 27 | 174 | 185 | 50 | 20 | 70.4 | 2.51 |
| Dougherty | Georgia | 3091 | 87 | 178 | 178 | 50 | 20 | 69.6 | 2.49 |
| Early | Georgia | 409 | 11 | 227 | 224 | 50 | 25 | 74.6 | 2.67 |
| Echols | Georgia | 182 | 5 | 100 | 90 | 50 | 10 | 59.9 | 2.14 |
| Glynn | Georgia | 2297 | 64 | 153 | 145 | 50 | 16 | 66.0 | 2.36 |
| Grady | Georgia | 853 | 24 | 172 | 170 | 50 | 19 | 68.7 | 2.45 |
| Lanier | Georgia | 288 | 8 | 91 | 99 | 50 | 11 | 60.9 | 2.17 |
| Lowndes | Georgia | 3428 | 96 | 96 | 100 | 50 | 11 | 61.0 | 2.18 |
| McIntosh | Georgia | 416 | 12 | 175 | 164 | 50 | 18 | 68.0 | 2.43 |
| Miller | Georgia | 207 | 6 | 212 | 203 | 50 | 22 | 72.3 | 2.58 |
| Mitchell | Georgia | 871 | 24 | 173 | 164 | 50 | 18 | 68.0 | 2.43 |
| Pierce | Georgia | 566 | 16 | 174 | 147 | 50 | 16 | 66.2 | 2.36 |
| Seminole | Georgia | 309 | 9 | 212 | 203 | 50 | 22 | 72.3 | 2.58 |
| Thomas | Georgia | 1469 | 41 | 140 | 138 | 50 | 15 | 65.2 | 2.33 |
| Ware | Georgia | 1140 | 32 | 131 | 97 | 50 | 11 | 60.7 | 2.17 |
| Wayne | Georgia | 972 | 27 | 191 | 142 | 50 | 16 | 65.6 | 2.34 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 763 | 21 | 150 | 141 | 50 | 16 | 65.5 | 2.34 |
| Henry | Alabama | 209 | 6 | 270 | 273 | 50 | 30 | 80.0 | 2.86 |
| Houston | Alabama | 246 | 7 | 212 | 203 | 50 | 22 | 72.3 | 2.58 |
| Geneva | Alabama | 1342 | 38 | 230 | 254 | 50 | 28 | 77.9 | 2.78 |

Table 7-6. Delivered cost for waste tires used as a fuel source for the JEA Brandy Branch facility.

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4876 | 137 | 69 | 53.5 | 50 | 6 | 55.9 | 2.00 |
| Baker | Florida | 390 | 11 | 23 | 23 | 50 | 3 | 52.5 | 1.88 |
| Bay | Florida | 4338 | 121 | 272 | 272 | 50 | 30 | 79.9 | 2.85 |
| Bradford | Florida | 258 | 7 | 36 | 32 | 50 | 4 | 53.5 | 1.91 |
| Calhoun | Florida | 574 | 16 | 167 | 154 | 50 | 17 | 66.9 | 2.39 |
| Citrus | Florida | 2704 | 76 | 150 | 122 | 50 | 13 | 63.4 | 2.27 |
| Clay | Florida | 3488 | 98 | 50 | 44 | 50 | 5 | 54.8 | 1.96 |
| Columbia | Florida | 1765 | 49 | 50 | 48 | 50 | 5 | 55.3 | 1.97 |
| Dixie | Florida | 161 | 5 | 127 | 109 | 50 | 12 | 62.0 | 2.21 |
| Duval | Florida | 13689 | 383 | 8 | 8 | 50 | 1 | 50.9 | 1.82 |
| Flagler | Florida | 4200 | 118 | 96 | 87 | 50 | 10 | 59.6 | 2.13 |
| Franklin | Florida | 129 | 4 | 228 | 214 | 50 | 24 | 73.5 | 2.63 |
| Gadsden | Florida | 479 | 13 | 155 | 171 | 50 | 19 | 68.8 | 2.46 |
| Gilchrist | Florida | 161 | 5 | 100 | 100 | 50 | 11 | 61.0 | 2.18 |
| Gulf | Florida | 280 | 8 | 261 | 249 | 50 | 27 | 77.4 | 2.76 |
| Hamilton | Florida | 88 | 2 | 76 | 73 | 50 | 8 | 58.0 | 2.07 |
| Hernando | Florida | 2341 | 66 | 175 | 152 | 50 | 17 | 66.7 | 2.38 |
| Holmes | Florida | 315 | 9 | 210 | 239 | 50 | 26 | 76.3 | 2.72 |
| Jackson | Florida | 1161 | 33 | 215 | 232 | 50 | 26 | 75.5 | 2.70 |
| Jefferson | Florida | 265 | 7 | 98 | 110 | 50 | 12 | 62.1 | 2.22 |
| Lafayette | Florida | 153 | 4 | 105 | 96 | 50 | 11 | 60.6 | 2.16 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 7256 | 203 | 165 | 142 | 50 | 16 | 65.6 | 2.34 |
| Leon | Florida | 8971 | 251 | 135 | 141 | 50 | 16 | 65.5 | 2.34 |
| Levy | Florida | 258 | 7 | 128 | 93 | 50 | 10 | 60.2 | 2.15 |
| Liberty | Florida | 34 | 1 | 176 | 190 | 50 | 21 | 70.9 | 2.53 |
| Madison | Florida | 372 | 10 | 98 | 110 | 50 | 12 | 62.1 | 2.22 |
| Marion | Florida | 3282 | 92 | 117 | 92 | 50 | 10 | 60.1 | 2.15 |
| Nassau | Florida | 1265 | 35 | 33 | 25 | 50 | 3 | 52.8 | 1.88 |
| Orange | Florida | 42856 | 1200 | 161 | 167 | 50 | 18 | 68.4 | 2.44 |
| Pasco | Florida | 14048 | 393 | 200 | 182 | 50 | 20 | 70.0 | 2.50 |
| Putnam | Florida | 817 | 23 | 85 | 67 | 50 | 7 | 57.4 | 2.05 |
| St. Johns | Florida | 4242 | 119 | 67 | 65 | 50 | 7 | 57.2 | 2.04 |
| Sumter | Florida | 1396 | 39 | 134 | 123 | 50 | 14 | 63.5 | 2.27 |
| Suwannee | Florida | 539 | 15 | 66 | 71 | 50 | 8 | 57.8 | 2.06 |
| Taylor | Florida | 219 | 6 | 134 | 135 | 50 | 15 | 64.9 | 2.32 |
| Union | Florida | 234 | 7 | 34 | 28 | 50 | 3 | 53.1 | 1.90 |
| Volusia | Florida | 19951 | 559 | 101 | 112 | 50 | 12 | 62.3 | 2.23 |
| Wakulla | Florida | 636 | 18 | 182 | 170 | 50 | 19 | 68.7 | 2.45 |
| Walton | Florida | 3185 | 89 | 240 | 272 | 50 | 30 | 79.9 | 2.85 |
| Washington | Florida | 168 | 5 | 207 | 234 | 50 | 26 | 75.7 | 2.71 |
| Baker | Georgia | 143 | 4 | 190 | 190 | 50 | 21 | 70.9 | 2.53 |
| Brantley | Georgia | 586 | 16 | 94 | 71 | 50 | 8 | 57.8 | 2.06 |
| Brooks | Georgia | 554 | 16 | 112 | 120 | 50 | 13 | 63.2 | 2.26 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 243 | 7 | 234 | 220 | 50 | 24 | 74.2 | 2.65 |
| Camden | Georgia | 1905 | 53 | 70 | 60 | 50 | 7 | 56.6 | 2.02 |
| Charlton | Georgia | 382 | 11 | 69 | 50 | 50 | 6 | 55.5 | 1.98 |
| Clinch | Georgia | 240 | 7 | 113 | 88 | 50 | 10 | 59.7 | 2.13 |
| Colquitt | Georgia | 1497 | 42 | 155 | 147 | 50 | 16 | 66.2 | 2.36 |
| Cook | Georgia | 571 | 16 | 118 | 127 | 50 | 14 | 64.0 | 2.28 |
| Decatur | Georgia | 977 | 27 | 177 | 190 | 50 | 21 | 70.9 | 2.53 |
| Dougherty | Georgia | 3091 | 87 | 185 | 185 | 50 | 20 | 70.4 | 2.51 |
| Early | Georgia | 409 | 11 | 229 | 229 | 50 | 25 | 75.2 | 2.69 |
| Echols | Georgia | 182 | 5 | 93 | 78 | 50 | 9 | 58.6 | 2.09 |
| Glynn | Georgia | 2297 | 64 | 86 | 91 | 50 | 10 | 60.0 | 2.14 |
| Grady | Georgia | 853 | 24 | 178 | 177 | 50 | 19 | 69.5 | 2.48 |
| Lanier | Georgia | 288 | 8 | 94 | 104 | 50 | 11 | 61.4 | 2.19 |
| Lowndes | Georgia | 3428 | 96 | 102 | 106 | 50 | 12 | 61.7 | 2.20 |
| McIntosh | Georgia | 416 | 12 | 109 | 108 | 50 | 12 | 61.9 | 2.21 |
| Miller | Georgia | 207 | 6 | 218 | 209 | 50 | 23 | 73.0 | 2.61 |
| Mitchell | Georgia | 871 | 24 | 180 | 171 | 50 | 19 | 68.8 | 2.46 |
| Pierce | Georgia | 566 | 16 | 107 | 92 | 50 | 10 | 60.1 | 2.15 |
| Seminole | Georgia | 309 | 9 | 218 | 209 | 50 | 23 | 73.0 | 2.61 |
| Thomas | Georgia | 1469 | 41 | 147 | 144 | 50 | 16 | 65.8 | 2.35 |
| Ware | Georgia | 1140 | 32 | 69 | 50 | 50 | 6 | 55.5 | 1.98 |
| Wayne | Georgia | 972 | 27 | 121 | 93 | 50 | 10 | 60.2 | 2.15 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 763 | 21 | 155 | 147 | 50 | 16 | 66.2 | 2.36 |
| Henry | Alabama | 209 | 6 | 265 | 254 | 50 | 28 | 77.9 | 2.78 |
| Houston | Alabama | 246 | 7 | 218 | 209 | 50 | 23 | 73.0 | 2.61 |
| Geneva | Alabama | 1342 | 38 | 240 | 261 | 50 | 29 | 78.7 | 2.81 |

Table 7-7. Delivered cost for waste tires used as a fuel source for the TAL Hopkins facility.

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4876 | 137 | 154 | 159 | 50 | 17 | 67.5 | 2.41 |
| Baker | Florida | 390 | 11 | 122 | 135 | 50 | 15 | 64.9 | 2.32 |
| Bay | Florida | 4338 | 121 | 147 | 126 | 50 | 14 | 63.9 | 2.28 |
| Bradford | Florida | 258 | 7 | 161 | 164 | 50 | 18 | 68.0 | 2.43 |
| Calhoun | Florida | 574 | 16 | 9 | 4 | 50 | 0 | 50.4 | 1.80 |
| Citrus | Florida | 2704 | 76 | 218 | 221 | 50 | 24 | 74.3 | 2.65 |
| Clay | Florida | 3488 | 98 | 181 | 192 | 50 | 21 | 71.1 | 2.54 |
| Columbia | Florida | 1765 | 49 | 108 | 112 | 50 | 12 | 62.3 | 2.23 |
| Dixie | Florida | 161 | 5 | 118 | 114 | 50 | 13 | 62.5 | 2.23 |
| Duval | Florida | 13689 | 383 | 140 | 157 | 50 | 17 | 67.3 | 2.40 |
| Flagler | Florida | 4200 | 118 | 230 | 239 | 50 | 26 | 76.3 | 2.72 |
| Franklin | Florida | 129 | 4 | 99 | 72 | 50 | 8 | 57.9 | 2.07 |
| Gadsden | Florida | 479 | 13 | 31 | 24 | 50 | 3 | 52.6 | 1.88 |
| Gilchrist | Florida | 161 | 5 | 148 | 151 | 50 | 17 | 66.6 | 2.38 |
| Gulf | Florida | 280 | 8 | 136 | 97 | 50 | 11 | 60.7 | 2.17 |
| Hamilton | Florida | 88 | 2 | 110 | 106 | 50 | 12 | 61.7 | 2.20 |
| Hernando | Florida | 2341 | 66 | 231 | 187 | 50 | 21 | 70.6 | 2.52 |
| Holmes | Florida | 315 | 9 | 66 | 91 | 50 | 10 | 60.0 | 2.14 |
| Jackson | Florida | 1161 | 33 | 90 | 86 | 50 | 9 | 59.5 | 2.12 |
| Jefferson | Florida | 265 | 7 | 52 | 53 | 50 | 6 | 55.8 | 1.99 |
| Lafayette | Florida | 153 | 4 | 111 | 102 | 50 | 11 | 61.2 | 2.19 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Lake | Florida | 7256 | 203 | 233 | 241 | 50 | 27 | 76.5 | 2.73 |
| Leon | Florida | 8971 | 251 | 23 | 11 | 50 | 1 | 51.2 | 1.83 |
| Levy | Florida | 258 | 7 | 170 | 137 | 50 | 15 | 65.1 | 2.32 |
| Liberty | Florida | 34 | 1 | 46 | 33 | 50 | 4 | 53.6 | 1.92 |
| Madison | Florida | 372 | 10 | 52 | 53 | 50 | 6 | 55.8 | 1.99 |
| Marion | Florida | 3282 | 92 | 192 | 200 | 50 | 22 | 72.0 | 2.57 |
| Nassau | Florida | 1265 | 35 | 155 | 178 | 50 | 20 | 69.6 | 2.49 |
| Orange | Florida | 42856 | 1200 | 257 | 279 | 50 | 31 | 80.7 | 2.88 |
| Pasco | Florida | 14048 | 393 | 268 | 281 | 50 | 31 | 80.9 | 2.89 |
| Putnam | Florida | 817 | 23 | 204 | 206 | 50 | 23 | 72.7 | 2.60 |
| St. Johns | Florida | 4242 | 119 | 198 | 213 | 50 | 23 | 73.4 | 2.62 |
| Sumter | Florida | 1396 | 39 | 202 | 222 | 50 | 24 | 74.4 | 2.66 |
| Suwannee | Florida | 539 | 15 | 91 | 97 | 50 | 11 | 60.7 | 2.17 |
| Taylor | Florida | 219 | 6 | 73 | 71 | 50 | 8 | 57.8 | 2.06 |
| Union | Florida | 234 | 7 | 145 | 153 | 50 | 17 | 66.8 | 2.39 |
| Volusia | Florida | 19951 | 559 | 232 | 260 | 50 | 29 | 78.6 | 2.81 |
| Wakulla | Florida | 636 | 18 | 33 | 24 | 50 | 3 | 52.6 | 1.88 |
| Walton | Florida | 3185 | 89 | 117 | 124 | 50 | 14 | 63.6 | 2.27 |
| Washington | Florida | 168 | 5 | 83 | 86 | 50 | 9 | 59.5 | 2.12 |
| Baker | Georgia | 143 | 4 | 97 | 75 | 50 | 8 | 58.3 | 2.08 |
| Brantley | Georgia | 586 | 16 | 231 | 215 | 50 | 24 | 73.7 | 2.63 |
| Brooks | Georgia | 554 | 16 | 83 | 67 | 50 | 7 | 57.4 | 2.05 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Georgia | 243 | 7 | 130 | 92 | 50 | 10 | 60.1 | 2.15 |
| Camden | Georgia | 1905 | 53 | 208 | 214 | 50 | 24 | 73.5 | 2.63 |
| Charlton | Georgia | 382 | 11 | 200 | 192 | 50 | 21 | 71.1 | 2.54 |
| Clinch | Georgia | 240 | 7 | 142 | 121 | 50 | 13 | 63.3 | 2.26 |
| Colquitt | Georgia | 1497 | 42 | 90 | 66 | 50 | 7 | 57.3 | 2.05 |
| Cook | Georgia | 571 | 16 | 119 | 83 | 50 | 9 | 59.1 | 2.11 |
| Decatur | Georgia | 977 | 27 | 52 | 42 | 50 | 5 | 54.6 | 1.95 |
| Dougherty | Georgia | 3091 | 87 | 133 | 92 | 50 | 10 | 60.1 | 2.15 |
| Early | Georgia | 409 | 11 | 95 | 81 | 50 | 9 | 58.9 | 2.10 |
| Echols | Georgia | 182 | 5 | 130 | 114 | 50 | 13 | 62.5 | 2.23 |
| Glynn | Georgia | 2297 | 64 | 217 | 239 | 50 | 26 | 76.3 | 2.72 |
| Grady | Georgia | 853 | 24 | 55 | 32 | 50 | 4 | 53.5 | 1.91 |
| Lanier | Georgia | 288 | 8 | 101 | 85 | 50 | 9 | 59.4 | 2.12 |
| Lowndes | Georgia | 3428 | 96 | 101 | 79 | 50 | 9 | 58.7 | 2.10 |
| McIntosh | Georgia | 416 | 12 | 247 | 263 | 50 | 29 | 78.9 | 2.82 |
| Miller | Georgia | 207 | 6 | 96 | 67 | 50 | 7 | 57.4 | 2.05 |
| Mitchell | Georgia | 871 | 24 | 94 | 63 | 50 | 7 | 56.9 | 2.03 |
| Pierce | Georgia | 566 | 16 | 189 | 155 | 50 | 17 | 67.1 | 2.39 |
| Seminole | Georgia | 309 | 9 | 96 | 67 | 50 | 7 | 57.4 | 2.05 |
| Thomas | Georgia | 1469 | 41 | 55 | 41 | 50 | 5 | 54.5 | 1.95 |
| Ware | Georgia | 1140 | 32 | 199 | 192 | 50 | 21 | 71.1 | 2.54 |
| Wayne | Georgia | 972 | 27 | 241 | 186 | 50 | 20 | 70.5 | 2.52 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Worth | Georgia | 763 | 21 | 90 | 65 | 50 | 7 | 57.2 | 2.04 |
| Henry | Alabama | 209 | 6 | 115 | 112 | 50 | 12 | 62.3 | 2.23 |
| Houston | Alabama | 246 | 7 | 96 | 71 | 50 | 8 | 57.8 | 2.06 |
| Geneva | Alabama | 1342 | 38 | 90 | 110 | 50 | 12 | 62.1 | 2.22 |

Table 7-8. Delivered cost for waste tires used as a fuel source for the GRU Deerhaven facility (within a travel time of 2-hours).

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4876 | 137 | 18 | 9.2 | 50 | 1 | 51.0 | 1.82 |
| Baker | Florida | 390 | 11 | 67 | 55 | 50 | 6 | 56.1 | 2.00 |
| Bradford | Florida | 258 | 7 | 51 | 37 | 50 | 4 | 54.1 | 1.93 |
| Citrus | Florida | 2704 | 76 | 95 | 79 | 50 | 9 | 58.7 | 2.10 |
| Clay | Florida | 3488 | 98 | 78 | 60 | 50 | 7 | 56.6 | 2.02 |
| Columbia | Florida | 1765 | 49 | 52 | 51 | 50 | 6 | 55.6 | 1.99 |
| Dixie | Florida | 161 | 5 | 52 | 44 | 50 | 5 | 54.8 | 1.96 |
| Duval | Florida | 13689 | 383 | 76 | 63 | 50 | 7 | 56.9 | 2.03 |
| Gilchrist | Florida | 161 | 5 | 49 | 35 | 50 | 4 | 53.9 | 1.92 |
| Hamilton | Florida | 88 | 2 | 68 | 67 | 50 | 7 | 57.4 | 2.05 |
| Hernando | Florida | 2341 | 66 | 119 | 109 | 50 | 12 | 62.0 | 2.21 |
| Jefferson | Florida | 265 | 7 | 95 | 105 | 50 | 12 | 61.6 | 2.20 |
| Lafayette | Florida | 153 | 4 | 83 | 60 | 50 | 7 | 56.6 | 2.02 |
| Lake | Florida | 7256 | 203 | 99 | 99 | 50 | 11 | 60.9 | 2.17 |
| Madison | Florida | 372 | 10 | 95 | 105 | 50 | 12 | 61.6 | 2.20 |
| Marion | Florida | 3282 | 92 | 68 | 58 | 50 | 6 | 56.4 | 2.01 |
| Nassau | Florida | 1265 | 35 | 103 | 79 | 50 | 9 | 58.7 | 2.10 |
| Putnam | Florida | 817 | 23 | 72 | 56 | 50 | 6 | 56.2 | 2.01 |
| St. Johns | Florida | 4242 | 119 | 112 | 85 | 50 | 9 | 59.4 | 2.12 |
| Sumter | Florida | 1396 | 39 | 79 | 80 | 50 | 9 | 58.8 | 2.10 |
| Suwannee | Florida | 539 | 15 | 63 | 66 | 50 | 7 | 57.3 | 2.05 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Taylor | Florida | 219 | 6 | 105 | 93 | 50 | 10 | 60.2 | 2.15 |
| Union | Florida | 234 | 7 | 62 | 47 | 50 | 5 | 55.2 | 1.97 |
| Volusia | Florida | 19951 | 559 | 120 | 111 | 50 | 12 | 62.2 | 2.22 |
| Brooks | Georgia | 554 | 16 | 109 | 116 | 50 | 13 | 62.8 | 2.24 |
| Cook | Georgia | 571 | 16 | 112 | 121 | 50 | 13 | 63.3 | 2.26 |
| Echols | Georgia | 182 | 5 | 100 | 90 | 50 | 10 | 59.9 | 2.14 |
| Lanier | Georgia | 288 | 8 | 91 | 99 | 50 | 11 | 60.9 | 2.17 |
| Lowndes | Georgia | 3428 | 96 | 96 | 100 | 50 | 11 | 61.0 | 2.18 |

Table 7-9. Delivered cost for waste tires used as a fuel source for the GRU Deerhaven facility (within a travel time of 2-hours with competing demand).

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4876 | 137 | 18 | 9.2 | 50 | 1 | 51.0 | 1.82 |
| Citrus | Florida | 2704 | 76 | 95 | 79 | 50 | 9 | 58.7 | 2.10 |
| Dixie | Florida | 161 | 5 | 52 | 44 | 50 | 5 | 54.8 | 1.96 |
| Gilchrist | Florida | 161 | 5 | 49 | 35 | 50 | 4 | 53.9 | 1.92 |
| Hamilton | Florida | 88 | 2 | 68 | 67 | 50 | 7 | 57.4 | 2.05 |
| Hernando | Florida | 2341 | 66 | 119 | 109 | 50 | 12 | 62.0 | 2.21 |
| Lafayette | Florida | 153 | 4 | 83 | 60 | 50 | 7 | 56.6 | 2.02 |
| Lake | Florida | 7256 | 203 | 99 | 99 | 50 | 11 | 60.9 | 2.17 |
| Marion | Florida | 3282 | 92 | 68 | 58 | 50 | 6 | 56.4 | 2.01 |
| Putnam | Florida | 817 | 23 | 72 | 56 | 50 | 6 | 56.2 | 2.01 |
| Sumter | Florida | 1396 | 39 | 79 | 80 | 50 | 9 | 58.8 | 2.10 |
| Suwannee | Florida | 539 | 15 | 63 | 66 | 50 | 7 | 57.3 | 2.05 |
| Cook | Georgia | 571 | 16 | 112 | 121 | 50 | 13 | 63.3 | 2.26 |
| Lanier | Georgia | 288 | 8 | 91 | 99 | 50 | 11 | 60.9 | 2.17 |
| Lowndes | Georgia | 3428 | 96 | 96 | 100 | 50 | 11 | 61.0 | 2.18 |

Table 7-10. Delivered cost for waste tires used as a fuel source for the JAX Brandy Branch facility (within a travel time of 2-hours).

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Alachua | Florida | 4876 | 137 | 69 | 53.5 | 50 | 6 | 55.9 | 2.00 |
| Baker | Florida | 390 | 11 | 23 | 23 | 50 | 3 | 52.5 | 1.88 |
| Bradford | Florida | 258 | 7 | 36 | 32 | 50 | 4 | 53.5 | 1.91 |
| Clay | Florida | 3488 | 98 | 50 | 44 | 50 | 5 | 54.8 | 1.96 |
| Columbia | Florida | 1765 | 49 | 50 | 48 | 50 | 5 | 55.3 | 1.97 |
| Duval | Florida | 13689 | 383 | 8 | 8 | 50 | 1 | 50.9 | 1.82 |
| Flagler | Florida | 4200 | 118 | 96 | 87 | 50 | 10 | 59.6 | 2.13 |
| Gilchrist | Florida | 161 | 5 | 100 | 100 | 50 | 11 | 61.0 | 2.18 |
| Hamilton | Florida | 88 | 2 | 76 | 73 | 50 | 8 | 58.0 | 2.07 |
| Jefferson | Florida | 265 | 7 | 98 | 110 | 50 | 12 | 62.1 | 2.22 |
| Lafayette | Florida | 153 | 4 | 105 | 96 | 50 | 11 | 60.6 | 2.16 |
| Madison | Florida | 372 | 10 | 98 | 110 | 50 | 12 | 62.1 | 2.22 |
| Marion | Florida | 3282 | 92 | 117 | 92 | 50 | 10 | 60.1 | 2.15 |
| Nassau | Florida | 1265 | 35 | 33 | 25 | 50 | 3 | 52.8 | 1.88 |
| Putnam | Florida | 817 | 23 | 85 | 67 | 50 | 7 | 57.4 | 2.05 |
| St. Johns | Florida | 4242 | 119 | 67 | 65 | 50 | 7 | 57.2 | 2.04 |
| Suwannee | Florida | 539 | 15 | 66 | 71 | 50 | 8 | 57.8 | 2.06 |
| Union | Florida | 234 | 7 | 34 | 28 | 50 | 3 | 53.1 | 1.90 |
| Volusia | Florida | 19951 | 559 | 101 | 112 | 50 | 12 | 62.3 | 2.23 |
| Brantley | Georgia | 586 | 16 | 94 | 71 | 50 | 8 | 57.8 | 2.06 |
| Brooks | Georgia | 554 | 16 | 112 | 120 | 50 | 13 | 63.2 | 2.26 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Camden | Georgia | 1905 | 53 | 70 | 60 | 50 | 7 | 56.6 | 2.02 |
| Charlton | Georgia | 382 | 11 | 69 | 50 | 50 | 6 | 55.5 | 1.98 |
| Clinch | Georgia | 240 | 7 | 113 | 88 | 50 | 10 | 59.7 | 2.13 |
| Cook | Georgia | 571 | 16 | 118 | 127 | 50 | 14 | 64.0 | 2.28 |
| Echols | Georgia | 182 | 5 | 93 | 78 | 50 | 9 | 58.6 | 2.09 |
| Glynn | Georgia | 2297 | 64 | 86 | 91 | 50 | 10 | 60.0 | 2.14 |
| Lanier | Georgia | 288 | 8 | 94 | 104 | 50 | 11 | 61.4 | 2.19 |
| Lowndes | Georgia | 3428 | 96 | 102 | 106 | 50 | 12 | 61.7 | 2.20 |
| McIntosh | Georgia | 416 | 12 | 109 | 108 | 50 | 12 | 61.9 | 2.21 |
| Pierce | Georgia | 566 | 16 | 107 | 92 | 50 | 10 | 60.1 | 2.15 |
| Ware | Georgia | 1140 | 32 | 69 | 50 | 50 | 6 | 55.5 | 1.98 |
| Wayne | Georgia | 972 | 27 | 121 | 93 | 50 | 10 | 60.2 | 2.15 |
| Worth | Georgia | 763 | 21 | 155 | 147 | 50 | 16 | 66.2 | 2.36 |

Table 7-11. Delivered cost for waste tires used as a fuel source for the JAX Brandy Branch facility (within a travel time of 2-hours with competing demand).

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Baker | Florida | 390 | 11 | 23 | 23 | 50 | 3 | 52.5 | 1.88 |
| Bradford | Florida | 258 | 7 | 36 | 32 | 50 | 4 | 53.5 | 1.91 |
| Clay | Florida | 3488 | 98 | 50 | 44 | 50 | 5 | 54.8 | 1.96 |
| Columbia | Florida | 1765 | 49 | 50 | 48 | 50 | 5 | 55.3 | 1.97 |
| Duval | Florida | 13689 | 383 | 8 | 8 | 50 | 1 | 50.9 | 1.82 |
| Flagler | Florida | 4200 | 118 | 96 | 87 | 50 | 10 | 59.6 | 2.13 |
| Nassau | Florida | 1265 | 35 | 33 | 25 | 50 | 3 | 52.8 | 1.88 |
| St. Johns | Florida | 4242 | 119 | 67 | 65 | 50 | 7 | 57.2 | 2.04 |
| Union | Florida | 234 | 7 | 34 | 28 | 50 | 3 | 53.1 | 1.90 |
| Volusia | Florida | 19951 | 559 | 101 | 112 | 50 | 12 | 62.3 | 2.23 |
| Brantley | Georgia | 586 | 16 | 94 | 71 | 50 | 8 | 57.8 | 2.06 |
| Camden | Georgia | 1905 | 53 | 70 | 60 | 50 | 7 | 56.6 | 2.02 |
| Charlton | Georgia | 382 | 11 | 69 | 50 | 50 | 6 | 55.5 | 1.98 |
| Clinch | Georgia | 240 | 7 | 113 | 88 | 50 | 10 | 59.7 | 2.13 |
| Echols | Georgia | 182 | 5 | 93 | 78 | 50 | 9 | 58.6 | 2.09 |
| Glynn | Georgia | 2297 | 64 | 86 | 91 | 50 | 10 | 60.0 | 2.14 |
| McIntosh | Georgia | 416 | 12 | 109 | 108 | 50 | 12 | 61.9 | 2.21 |
| Pierce | Georgia | 566 | 16 | 107 | 92 | 50 | 10 | 60.1 | 2.15 |
| Ware | Georgia | 1140 | 32 | 69 | 50 | 50 | 6 | 55.5 | 1.98 |
| Wayne | Georgia | 972 | 27 | 121 | 93 | 50 | 10 | 60.2 | 2.15 |
| Worth | Georgia | 763 | 21 | 155 | 147 | 50 | 16 | 66.2 | 2.36 |

Table 7-12. Delivered cost for waste tires used as a fuel source for the TAL Hopkins facility (within a travel time of 2-hours).

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 574 | 16.1 | 9 | 4 | 50 | 0 | 50.4 | 1.80 |
| Columbia | Florida | 1765 | 49.4 | 108 | 112 | 50 | 12 | 62.3 | 2.23 |
| Dixie | Florida | 161 | 4.5 | 118 | 114 | 50 | 13 | 62.5 | 2.23 |
| Franklin | Florida | 129 | 3.6 | 99 | 72 | 50 | 8 | 57.9 | 2.07 |
| Gadsden | Florida | 479 | 13.4 | 31 | 24 | 50 | 3 | 52.6 | 1.88 |
| Hamilton | Florida | 88 | 2.5 | 110 | 106 | 50 | 12 | 61.7 | 2.20 |
| Holmes | Florida | 315 | 8.8 | 66 | 91 | 50 | 10 | 60.0 | 2.14 |
| Jackson | Florida | 1161 | 32.5 | 90 | 86 | 50 | 9 | 59.5 | 2.12 |
| Jefferson | Florida | 265 | 7.4 | 52 | 53 | 50 | 6 | 55.8 | 1.99 |
| Lafayette | Florida | 153 | 4.3 | 111 | 102 | 50 | 11 | 61.2 | 2.19 |
| Leon | Florida | 8971 | 251.2 | 23 | 11 | 50 | 1 | 51.2 | 1.83 |
| Liberty | Florida | 34 | 0.9 | 46 | 33 | 50 | 4 | 53.6 | 1.92 |
| Madison | Florida | 372 | 10.4 | 52 | 53 | 50 | 6 | 55.8 | 1.99 |
| Suwannee | Florida | 539 | 15.1 | 91 | 97 | 50 | 11 | 60.7 | 2.17 |
| Taylor | Florida | 219 | 6.1 | 73 | 71 | 50 | 8 | 57.8 | 2.06 |
| Wakulla | Florida | 636 | 17.8 | 33 | 24 | 50 | 3 | 52.6 | 1.88 |
| Walton | Florida | 3185 | 89.2 | 117 | 124 | 50 | 14 | 63.6 | 2.27 |
| Washington | Florida | 168 | 4.7 | 83 | 86 | 50 | 9 | 59.5 | 2.12 |
| Baker | Georgia | 143 | 4.0 | 97 | 75 | 50 | 8 | 58.3 | 2.08 |
| Brooks | Georgia | 554 | 15.5 | 83 | 67 | 50 | 7 | 57.4 | 2.05 |
| Colquitt | Georgia | 1497 | 41.9 | 90 | 66 | 50 | 7 | 57.3 | 2.05 |
| Cook | Georgia | 571 | 16.0 | 119 | 83 | 50 | 9 | 59.1 | 2.11 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Decatur | Georgia | 977 | 27.4 | 52 | 42 | 50 | 5 | 54.6 | 1.95 |
| Early | Georgia | 409 | 11.4 | 95 | 81 | 50 | 9 | 58.9 | 2.10 |
| Grady | Georgia | 853 | 23.9 | 55 | 32 | 50 | 4 | 53.5 | 1.91 |
| Lanier | Georgia | 288 | 8.1 | 101 | 85 | 50 | 9 | 59.4 | 2.12 |
| Lowndes | Georgia | 3428 | 96.0 | 101 | 79 | 50 | 9 | 58.7 | 2.10 |
| Miller | Georgia | 207 | 5.8 | 96 | 67 | 50 | 7 | 57.4 | 2.05 |
| Mitchell | Georgia | 871 | 24.4 | 94 | 63 | 50 | 7 | 56.9 | 2.03 |
| Seminole | Georgia | 309 | 8.7 | 96 | 67 | 50 | 7 | 57.4 | 2.05 |
| Thomas | Georgia | 1469 | 41.1 | 55 | 41 | 50 | 5 | 54.5 | 1.95 |
| Worth | Georgia | 763 | 21.4 | 90 | 65 | 50 | 7 | 57.2 | 2.04 |
| Henry | Alabama | 209 | 5.8 | 115 | 112 | 50 | 12 | 62.3 | 2.23 |
| Houston | Alabama | 246 | 6.9 | 96 | 71 | 50 | 8 | 57.8 | 2.06 |
| Geneva | Alabama | 1342 | 37.6 | 90 | 110 | 50 | 12 | 62.1 | 2.22 |

Table 7-13. Delivered cost for waste tires used as a fuel source for the TAL Hopkins facility (within a travel time of 2-hours with competing demand).

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Calhoun | Florida | 574 | 16.1 | 9 | 4 | 50 | 0 | 50.4 | 1.80 |
| Franklin | Florida | 129 | 3.6 | 99 | 72 | 50 | 8 | 57.9 | 2.07 |
| Gadsden | Florida | 479 | 13.4 | 31 | 24 | 50 | 3 | 52.6 | 1.88 |
| Holmes | Florida | 315 | 8.8 | 66 | 91 | 50 | 10 | 60.0 | 2.14 |
| Jackson | Florida | 1161 | 32.5 | 90 | 86 | 50 | 9 | 59.5 | 2.12 |
| Jefferson | Florida | 265 | 7.4 | 52 | 53 | 50 | 6 | 55.8 | 1.99 |
| Leon | Florida | 8971 | 251.2 | 23 | 11 | 50 | 1 | 51.2 | 1.83 |
| Liberty | Florida | 34 | 0.9 | 46 | 33 | 50 | 4 | 53.6 | 1.92 |
| Madison | Florida | 372 | 10.4 | 52 | 53 | 50 | 6 | 55.8 | 1.99 |
| Taylor | Florida | 219 | 6.1 | 73 | 71 | 50 | 8 | 57.8 | 2.06 |
| Wakulla | Florida | 636 | 17.8 | 33 | 24 | 50 | 3 | 52.6 | 1.88 |
| Walton | Florida | 3185 | 89.2 | 117 | 124 | 50 | 14 | 63.6 | 2.27 |
| Washington | Florida | 168 | 4.7 | 83 | 86 | 50 | 9 | 59.5 | 2.12 |
| Baker | Georgia | 143 | 4.0 | 97 | 75 | 50 | 8 | 58.3 | 2.08 |
| Brooks | Georgia | 554 | 15.5 | 83 | 67 | 50 | 7 | 57.4 | 2.05 |
| Colquitt | Georgia | 1497 | 41.9 | 90 | 66 | 50 | 7 | 57.3 | 2.05 |
| Decatur | Georgia | 977 | 27.4 | 52 | 42 | 50 | 5 | 54.6 | 1.95 |
| Early | Georgia | 409 | 11.4 | 95 | 81 | 50 | 9 | 58.9 | 2.10 |
| Grady | Georgia | 853 | 23.9 | 55 | 32 | 50 | 4 | 53.5 | 1.91 |
| Miller | Georgia | 207 | 5.8 | 96 | 67 | 50 | 7 | 57.4 | 2.05 |
| Mitchell | Georgia | 871 | 24.4 | 94 | 63 | 50 | 7 | 56.9 | 2.03 |

| County | State | Waste Tires (tons/yr) | Energy Equivalent (BBtu/yr) | Travel time (minutes) | Distance (miles) | Processing Cost ($/ton) | Transportation Cost ($/ton) | Delivered Cost ($/ton) | Delivered Cost ($/MMBtu) |
|---|---|---|---|---|---|---|---|---|---|
| Seminole | Georgia | 309 | 8.7 | 96 | 67 | 50 | 7 | 57.4 | 2.05 |
| Thomas | Georgia | 1469 | 41.1 | 55 | 41 | 50 | 5 | 54.5 | 1.95 |
| Worth | Georgia | 763 | 21.4 | 90 | 65 | 50 | 7 | 57.2 | 2.04 |
| Henry | Alabama | 209 | 5.8 | 115 | 112 | 50 | 12 | 62.3 | 2.23 |
| Houston | Alabama | 246 | 6.9 | 96 | 71 | 50 | 8 | 57.8 | 2.06 |
| Geneva | Alabama | 1342 | 37.6 | 90 | 110 | 50 | 12 | 62.1 | 2.22 |

# 8. SUMMARY

Research was conducted to explore the use of alternative sources of fuel from the municipal solid waste stream as a partial replacement of fossil fuel. In this project waste components from the municipal solid waste (MSW) and construction and demolition debris (C&D) were identified for their potential to be used as a fuel source for energy production. Four major waste streams were identified and detailed analysis was performed on these potential waste stream candidates. These include C&D wood, processed MSW (and RDF), yard trash and waste tires.

The results suggest that these waste streams have the potential to be used as a fuel source in the project region. A good volume of sustainable supply of these waste streams is available for the plants using them. The major cost fraction was identified as being the processing costs. The issue of treated wood making its way to the C&D wood waste or the yard waste stream is one of the concerns for its use, as the metals in contaminated wood will get concentrated in the ash. Waste tires with a very high calorific value are a good candidate for use as fuel.

## 9. LITERATURE CITED AND RELATED READING MATERIALS


Adolfson Associates, Inc., Adolfson Associates, Inc., in association with Kim Coble, "Tire fire contingency plan - toxicology aspects," prepared for Tacoma-Pierce County Health Department, Tacoma, WA, September 1994.

Albertson, M.; Pruden, A.; and Oliver R. “Enhanced anaerobic digestion of biomass waste for optimized production of renewable energy and solids for compost” International Congress Series, 2006, 1293, 221– 229.

Allen, J.; and Browne, M. “Logistics management and costs of biomass fuel supply” International Journal of Physical Distribution & Logistics Management, 1998, 28(6), 463-477.

Am Test, Inc., 1991. Am Test, Inc., "Source emission evaluation, volume I - State of Washington, Department of Ecology, rubber tire chip trial burn at Holnam Incorporated Industries Stack Testing & Chemical Analysis, October 15-19, 1990," January 23, 1991.

Baggio, P.; Baratieri, M.; Gasparella, A.; and Longo, G. “Energy and environmental analysis of an innovative system based on municipal solid waste (msw) pyrolysis and combined cycle” Applied Thermal Engineering, 2007 (Accepted Menu Script) – DOI - 10.1016/j.applthermaleng.2007.03.028

Bridgwater, A.; Toft, A.; and Brammer, G. “A techno-economic comparison of power production by biomass fast pyrolysis with gasification and combustion” Renewable and Sustainable Energy Reviews, 2002, 6, 181–248.

Brown, M.; and Buranakarn, V. Resources, “Emergy indices and ratios for sustainable material cycles and recycle options”. Conservation and Recycling, 2003, 38, 1-22.

Chaya, W.; and Gheewala, S. “Life cycle assessment of MSW-to-energy schemes in Thailand” Journal of Cleaner Production, 2007, 15, 1463-1468.

Clark, et al., 1991. C. Clark, K. Meardon, and D. Russell, Pacific Environmental Services, "Burning tires for fuel and tire pyrolysis: Air implications" prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Control Technology Center, EPA-450/3-91-024 (NTIS PB-92-145358), Research Triangle Park, NC, December 1991.

Cochran, K.; Townsend, T.; Reinhart, D.; and Heck, H. “Estimation of regional building-related C&D debris generation and composition: Case study for Florida, US” Waste Management, 2007, 27, 921–931.

Consonni, S.; Giugliano, M.; and Grosso M. “Alternative strategies for energy recovery from municipal solid waste Part A: Mass and energy balances” Waste Management, 2005, 25, 123–135.

Consonni, S.; Giugliano, M.; and Grosso M. “Alternative strategies for energy recovery from municipal solid waste Part B: Emission and cost estimates” Waste Management, 2005, 25, 137–148.

Corti, A.; and Lombardi, L. “End life tires: Alternative final disposal processes compared by LCA” Energy, 2004, 29, 2089–2108.

Demirbas, A. “Biomass resources facilities and biomass conversion processing for fuels and chemicals” Energy Conservation and Management, 2001, 42, 1357-1378.

Dennis, 1991. Daniel Dennis, "TDF - Report on test-burning of tire-derived fuel in solid fuel combustors, revision 2," source test of Monsanto K. G. Krummrich Plant, Sauget, IL, prepared for Illinois Department of Commerce and Community Affairs, July 22, 1991.

Di Maria, F.; and Pavesi, G. “RDF to energy plant for a central Italian region SUW management system: Energetic and economical analysis” Applied Thermal Engineering, 2006, 26, 1291–1300.

Duerr, M.; Gair, S.; Cruden, A.; and McDonald, J. “Hydrogen and electrical energy from organic waste treatment” International Journal of Hydrogen Energy, 2007, 32, 705 – 709.

Faaij, A. “Bio-energy in Europe: Changing technology choices” Energy Policy, 2006, 34, 322–342.

Fernando, S.; Adhikari, S.; Chandrapal, C.; and Murali, N. “Biorefineries: Current status, challenges, and future direction” Energy & Fuels, 2006, 20, 1727-1737.

Fobil, J.; Carboo, D.; and Armah, N. “Evaluation of municipal solid wastes (MSW) for utilization in energy production in developing countries” International Journal of Environmental Technology and Management, 2005, 5(1), 76-86.

Giugliano, M.; Grosso, M.; and Rigamonti, L. “Energy recovery from municipal waste: A case study for a middle-sized Italian district” Waste Management, 2007, (in press).

IAFC and STMC, 1992. International Association of Fire Chiefs and the Scrap Tire Management Council, "Guidelines for the prevention and management of scrap tire fires" Scrap Tire Management Council, Washington, D.C.

Igoni, A.; Ayotamuno, M.; Ogaji, S.; and Probert, S. “Municipal solid-waste in Port Harcourt, Nigeria” Applied Energy, 2007, 84, 664–670.

Jambeck, J.; Weitz, K.; Solo-Gabriele, H.; Townsend, T.; and Thorneloe, S. “CCA-treated wood disposed in landfills and life-cycle trade-offs with waste-to-energy and MSW landfill disposal”. Waste Management, 2007, 27, S21-S28.

Jang, J.; Yoo, T.; Oh, J.; and Iwasaki, I. Resources, “Discarded tire recycling practices in the United States, Japan and Korea” Conservation and Recycling, 1998, 22, 1–14.

Joel I. Reisman, Paul M. Lemieux. “Air emissions from scrap tire combustion” U.S. Environmental Protection Agency, October, 1997.

Jones, 1990. R.M. Jones, J.M. Kennedy, Jr., and N.L. Heberer, "Supplementary firing of tire-derived fuel (TDF) in a combination fuel boiler". TAPPI Journal, May 1990.

Katinas, V.; Markevicius, A.; and Kavaliauskas, A. “Current status and prospects of biomass resources for energy production in Lithuania”. Renewable Energy, 2007, 32, 884–894.

Kaylen, M. “An economic analysis of using alternative fuels in a mass burn boiler”. Bioresource Technology, 2005, 96, 1943–1949.

Lee, D.; and Tay, J. “Energy recovery in sludge management processes” Journal of Residuals Science & Technology, 2004, 1(2), 133-139.

Lemieux and DeMarini, 1992. P. M. Lemieux and D. DeMarini, "Mutagenicity of emissions from the simulated open burning of scrap rubber tires," U.S. Environmental Protection Agency, Control Technology Center, Office of Research and Development, EPA-600/R-92-127 (NTIS PB-92-217009), July 1992.

Lemieux, 1994. P.M. Lemieux, “Pilot-scale evaluation of the potential for emissions of hazardous air pollutants from combustion of tire-derived fuel,” U.S. Environmental Protection Agency, Control Technology Center, EPA-600/R-94-070 (NTIS PB-94-169463),April 1994

Lemieux, and Ryan, 1993. P. M. Lemieux and J. V. Ryan, "Characterization of air pollutants emitted from a simulated scrap tire fire," Journal of the Air and Waste Management Association, 1993, 43, 1106-1115.

Luoranen, M.; and Horttanainen, M. “Co-generation based energy recovery from municipal solid waste integrated with the existing energy supply system” Waste Management, 2007, (in press).

Malcolm Pirnie, 1991. Malcolm Pirnie, Inc., "Air emissions associated with the combustion of scrap tires for energy recovery," prepared for Ohio Air Quality Development Authority, May 1991.

McGowin, C.; and Wiltsee, G. “Strategic analysis of biomass and waste fuels for electric power generation” Biomass and Bioenergy, 1996, 10(2/3), 167-175.

Murphy, J.; and McKeogh, E. “The benefits of integrated treatment of wastes for the production of energy” Energy, 2006, 31, 294–310.

Murphy, J.D.; and Power, N. “A technical, economic, and environmental analysis of energy production from newspaper in Ireland” Waste Management, 2007, 27, 177–192.

P.M.Lemieux and J.V.Ryan. “Characterization of air pollutants emitted from a simulated scrap tire fire” Journal of the Air and Waste Management Association, 1993, 43, 1106-1115.

Pace, 1990. Pace Laboratories, Incorporated, "Results for the March 12-16, 1990 Tire 43 Derived Fuel Trial Burn Testing on the Unit 3 Stack at the Champion International Corporation Facility Located in Sartell, Minnesota," Minneapolis, MN, May 24, 1990.

Reddy, S.; Basha, S.; Joshi, H.; Sravan Kumar, V.; Jha, B.; and Ghosh, P. “Modeling the energy content of combustible ship-scrapping waste at Alang–Sosiya, India, using multiple regression analysis” Waste Management, 2005, 25, 747–754.

Ryan, 1989. J. Ryan, Acurex Corporation, "Characterization of emissions from the simulated open burning of scrap tires," U.S. Environmental Protection Agency, Control Technology Center, EPA-600/2-89-054 (NTIS PB-90-126004), Research Triangle Park, NC, October 1989.

Schmidt, J.; Holm, P.; Merrild, A.; and Christensen, P. “Life cycle assessment of the waste hierarchy – A Danish case study on waste paper” Waste Management, 2007, 27(11), 1519-1530.

Sharma, V.; Fortuna, F.; Mincarini, M.; Berillo, M.; and Cornacchia, G. “Disposal of waste tyres for energy recovery and safe environment” Applied Energy, 2000, 65, 381-394.

Sharma, V.; Mincarini, M.; Fortuna, F.; Cognini, F.; and Cornacchia, G. “Disposal of waste tyres for energy recovery and safe environment - Review” Energy Conversion & Management, 1998, 39(5/6), 511-528.

State of Washington, 1986c. State of Washington, Department of Ecology, "Measurement of polynuclear aromatic hydrocarbons and metals emitted from the burning of tires at Crown Zellerbach, Port Angeles, Source Test 86-10a," November 25, 1986.

Sufian, M.; and Bala, B. “Modelling of electrical energy recovery from urban solid waste system: The case of Dhaka city” Renewable Energy, 2006, 31, 1573–1580.

Swami, S.; and Abraham, M. “Integrated catalytic process for conversion of biomass to hydrogen” Energy & Fuels, 2006, 20, 2616-2622.

Themelis, N.; and Millrath, K. “The benefits of integrated treatment of wastes for the production of energy” 12th North American Waste to Energy Conference.

Vaidyanathan, A.; Mulholland, J.; Ryu, J.;Smith, M.; and Circeo, L. Jr. “Characterization of fuel gas products from the treatment of solid waste streams with a plasma arc torch” Journal of Environmental Management, 2007, 82, 77–82.

Van Wyk. “Biodevelopment of wastepaper as a resource of renewable energy: Influence of enzyme concentration and paper amount on the bioconversion process” Journal of Energy & Fuels 2002, 16, 1277-1279.

Wolsky, A.; and Gaines, L. “DISCARDED TIRES - A potential source of hydrocarbons to displace petroleum” Resources and Energy, 1981, 3, 195-206.

Woolridge, A.; Ward, G.; Phillips, P.; Collins, M.; and Gandy, S. “Life cycle assessment for reuse/recycling of donated waste textiles compared to use of virgin material: An UK energy saving perspective” Resources, Conservation and Recycling, 2006, 46, 94–103.

Yang, Y.; Phan, A.; Ryu, C.; Sharifi, V.; and Swithenbank, J. “Mathematical modelling of slow pyrolysis of segregated solid wastes in a packed-bed pyrolyser” Fuel, 2007, 86, 169–180.