Energy Efficiency as a Resource:
South Region

December 2009

WRITTEN BY:

Sandy Glatt
Project Manager State and Utility Partnerships
Office of Industrial Technologies Program
U.S. Department of Energy

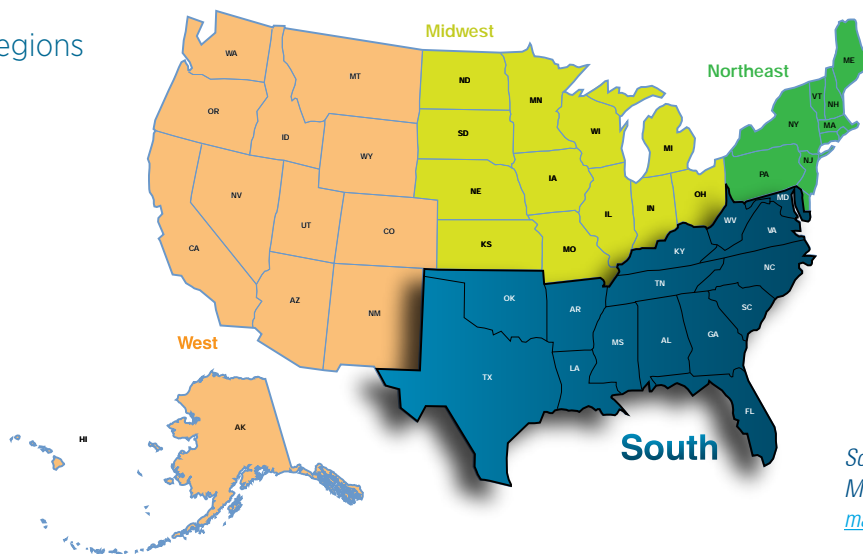**Ryan Harry**
Technical Research Analyst
BCS, Incorporated

Garrett Shields
Research Associate
BCS, Incorporated

Table of Contents

Exhibit 1:
U.S. Census Regions

Source: Stats Indiana, Boundary Maps. www.stats.indiana.edu/maptools/boundary.asp.

1. South Regional Energy Intensity

The Southern United States is one of four regions defined by the U.S. Census Bureau (Exhibit 1), composed of the following states:

- Alabama
- Arkansas
- Delaware
- District of Columbia
- Florida
- Georgia
- Kentucky
- Louisiana
- Maryland
- Mississippi
- North Carolina
- Oklahoma
- South Carolina
- Tennessee
- Texas
- Virginia
- West Virginia

The South leads the nation in terms of value of shipments in many important manufacturing sectors. In 2006, these leading industries included beverage and tobacco products, textile mills, textile product mills, paper, petroleum and coal products, chemicals, plastic and rubber products, nonmetallic mineral products, electrical equipment and appliances, and furniture. Exhibit 2 provides value of shipment data for the four census regions that make up the U.S. manufacturing sector. Highlighted rows are sectors where the South led the nation in product shipments in 2006.

Despite leading the country in value of shipments within the sectors listed above, the South has significantly higher energy intensities[*] compared to the national average in several sectors. Sectors in which the disparity in intensity results in the greatest overuse of energy include chemicals, printing, paper, textile product mills, and plastic and rubber products. Exhibit 3 details the relative energy intensity of these five industries compared to the national average.

Exhibit 2: 2006 Value of Shipments across Each Census Regions

NAICS Code	Manufacturing Sector Description	Value of Shipments by Census Region ($1,000s)			
		Midwest	Northeast	South	West
311	Food	$204,666,920	$65,793,261	$167,671,682	$98,574,804
312	Beverage & Tobacco Products	$17,311,076	$10,376,689	$67,096,187	$24,179,977
313	Textile Mills	$1,098,299	$4,963,887	$27,712,405	$1,970,605

* Energy intensity is the measure of energy consumed, in British thermal units (Btu), per dollar of gross domestic product (GDP) earned. GDP is equivalent to the value added to a manufactured good.

NAICS Code	Manufacturing Sector Description	Value of Shipments by Census Region ($1,000s)			
		Midwest	Northeast	South	West
314	Textile Product Mills	$2,735,095	$3,349,553	$22,290,390	$3,322,493
315	Apparel	$1,613,014	$6,799,668	$9,979,108	$10,774,562
316	Leather & Allied Products	$1,416,708	$1,144,563	$689,199	$832,329
321	Wood Products	$23,771,713	$11,108,678	$48,983,012	$28,098,923
322	Paper	$47,115,379	$28,350,897	$69,716,583	$20,686,685
323	Printing & Related Activities	$35,013,054	$21,770,053	$25,769,420	$16,141,181
324	Petroleum & Coal Products	$81,870,541	$46,307,975	$275,272,040	$91,124,660
325	Chemicals	$138,746,405	$122,465,240	$342,698,414	$51,185,822
326	Plastic & Rubber Products	$75,452,678	$29,422,093	$79,933,459	$26,167,217
327	Nonmetallic Mineral Products	$32,037,818	$17,491,499	$50,065,523	$25,597,119
331	Primary Metals	$92,601,422	$40,650,773	$77,814,960	$21,484,148
332	Fabricated Metal Products	$118,929,503	$52,537,662	$99,115,323	$46,303,596
333	Machinery	$143,226,056	$44,898,571	$104,749,626	$33,294,459
334	Computer & Electronic Products	$62,566,287	$64,150,714	$118,927,414	$144,802,804
335	Electrical Equipment & Appliances	$43,387,114	$19,417,128	$44,584,064	$11,071,376
336	Transportation Equipment	$331,468,454	$45,738,269	$225,728,247	$95,807,598
337	Furniture	$27,548,271	$10,243,628	$32,353,880	$14,888,967
339	Miscellaneous	$37,948,982	$37,022,053	$34,738,984	$39,342,698

Source: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

Exhibit 3: 2006 South Energy Intensity Compared to National Average
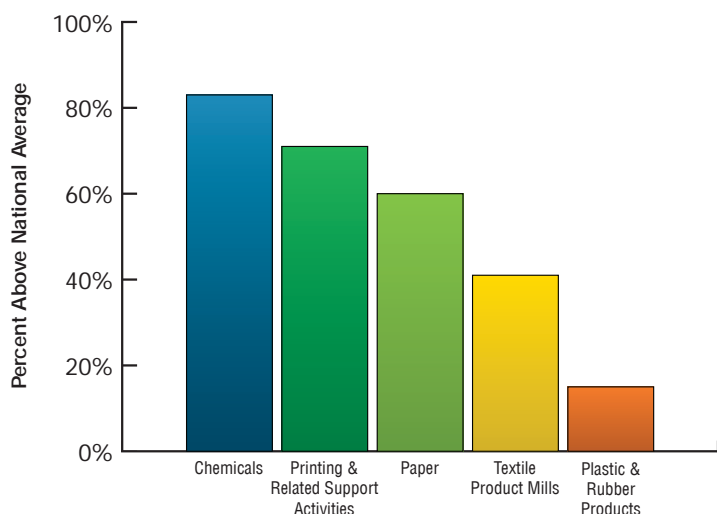
Some of this high energy intensity is a result of lower-than-average energy prices across the South region, at $10.99 per million Btu in 2006 as illustrated in Exhibit 4. The average energy prices used in Exhibit 4 reflect the full range of fuels, including coal, natural gas, petroleum, and biomass. The South's energy prices are only $0.14 per million Btu above the Midwest—which has the lowest average energy price—and $2.52 per million Btu below the Northeast. Lower energy prices tend to promote greater energy consumption because the cost of implementing energy efficiency measures to reduce consumption is higher than simply consuming the energy. Also, energy-intensive industries will seek to operate in geographical regions where energy prices are low, leading to higher energy intensities across the region. This is because the industries that use large amounts of energy can significantly reduce their costs by simply positioning themselves near large sources of cheap energy. The fact that a significant portion of the aluminum smelting industry has traditionally located itself in the northwest region of the United States is an example of this cost effect. Locating in this region was done in order to take advantage of the lower cost of energy produced by the large hydro-electric power stations in the area.

Another contributing factor to higher energy intensity in many of these Southern manufacturing sectors is lower shipment values compared to the national average. All other things being equal, a product that has a lower shipment value will have a higher energy intensity. This is due to the influence of the gross domestic product (GDP) on both energy intensity and the relative value of shipments for a given product. Even with relatively low-value products, the South has the potential to significantly lower its energy intensity. The South's lower-value products compared to national average product values—as evidenced by the GDP–Material Inputs ratio (Appendices A and B)—do not justify the significantly higher energy intensities for Southern products. This concept is further supported by details in each of the following sections of this report.

Harnessing energy efficiency as a resource will provide the South with an energy source alternative to the historical approach of simply increasing energy supply. Reducing energy consumption will save manufacturers money in the short term by reducing monthly energy bills and operating costs. Long-term energy cost savings will also result from investments in energy efficiency rather than energy supply. The adoption of energy-efficient technologies is highly dependent on avoided costs by consumers and utilities. When avoided costs are greater than the cost of energy efficiency technologies, industrial energy consumers will tend to adopt those technologies. When avoided costs are lower than the cost of implementing the energy-efficient technologies, however, customers will find more value in simply

Exhibit 4: 2006 Regional Average Industrial Energy Prices

Region	Average Industrial Sector Energy Price ($/Million Btu)
Midwest	$10.85
Northeast	$13.51
South	$10.99
West	$12.72

Source: Energy Information Administration, State Energy Data System, Tables S6 and S4a, November 2008. www.eia.doe.gov/emeu/states/_seds.html.

5

consuming the energy without investing in these technologies. Energy prices are the most significant point of reference in considering cost avoidance. Electricity and natural gas prices are especially important because these energy sources are the most widely used. These prices vary greatly depending on geographic location and must be considered on regional and state bases. Energy costs will decrease by reducing energy generation and transmission. Furthermore, pending carbon legislation in the United States will also reduce the value of energy supply relative to energy demand-savings over the long term, as the pending legislation would increase the price of energy and the cost of using energy.

Aggregating the short- and long-term energy savings means a more profitable and competitive Southern manufacturing sector, both now and in the future. Additionally, investing in energy efficiency will insulate the South's manufacturing sector from fossil-energy price volatility and shocks, such as Hurricane Katrina's effect on natural gas prices in 2005 and 2006. For utilities, using energy efficiency instead of traditional energy supply means energy needs can be met by making small, incremental investments in energy efficiency rather than large, risky investments

in energy supply. Pending carbon legislation will further increase the need for non-carbon-emitting energy resources that will be increasingly expensive for utilities to own and operate. Meeting state and national energy consumption and greenhouse gas emissions goals will also become increasingly important.

This report will highlight five leading Southern manufacturing sectors with significantly higher-than-average energy intensities: chemical manufacturing, printing and related support activities, paper manufacturing, textile product mills, and plastics and rubber products manufacturing. The report will provide detailed information on manufacturing industry subsectors and identify key energy-saving opportunities. By adopting energy efficiency measures in order to reduce their energy intensity to the national average, these five Southern manufacturing sectors could have reduced energy consumption by 1,763 trillion Btu± and saved approximately $19.4 billion+ in energy costs during 2006. The estimates in this report are based on 2006 U.S. Census Bureau (Census) and Energy Information Administration (EIA) data. See Appendices A and B for detailed energy-consumption data.

± Potential energy savings is determined by: Energy Consumed - Energy Consumed / (1 + Percent Difference of South Energy Intensity from National Average) = Energy Savings Potential. This estimate is used throughout the report.

+ Potential cost savings are determined by: Energy Savings Potential x $10.99 per Million Btu = Cost Savings. This savings assumes an average South energy cost of $10.99 per million Btu as illustrated in Exhibit 4. This estimate is used throughout the report.

1.1. Chemical Manufacturing (NAICS 325)

Just over half of the nation's chemical manufacturing takes place in the South, as shown in Exhibit 5. With a total value of shipments at nearly $135 billion,§ Texas alone surpasses the value of chemical manufacturing shipped in the West and the Northeast, while falling just short of the Midwest's $139 billion. The largest share of the chemical manufacturing industry in the South exists in Texas, Louisiana, and North Carolina. The lower energy prices in the South are an important reason why this energy-intensive industry is so predominant in the region.

Chemical production in the South encompasses a wide variety of subsectors, including basic chemical manufacturing, synthetic rubbers and fibers, pharmaceuticals and medicines, cleaning agents, pesticides and fertilizers, and paints. Exhibit 6 provides information about the South's primary chemical manufacturing subsectors, including percentage of subsector shipments as part of the larger chemical manufacturing shipments, energy

Exhibit 5: 2006 National Chemical Manufacturing Shipments
(IN THOUSANDS OF DOLLARS)
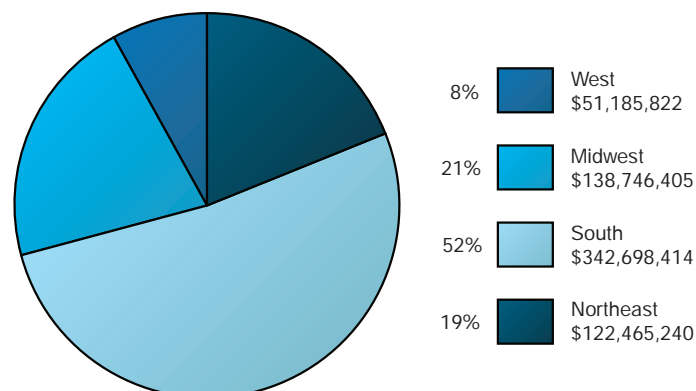
8%	West $51,185,822
21%	Midwest $138,746,405
52%	South $342,698,414
19%	Northeast $122,465,240

Source: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMain-PageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

intensity, and *GDP–Material Input* ratio.** As detailed in Exhibit 6, 44 percent of chemical manufacturing in the South is the production of basic chemicals, such as petrochemicals, industrial gases,

Exhibit 6: 2006 Southern Chemical Manufacture Summary

Description (NAICS Code)	Percentage of Total Shipments	Estimated South Energy Intensity (Btu/$GDP)	Estimated National Energy Intensity (Btu/$GDP)	Percent above National Average
Chemicals (325)	100.0%	17,071	9,290	83.8%
Basic Chemical Manufacturing (3251)	44.3%	26,935	23,473	14.7%
Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments (3252)	20.8%	26,493	21,750	21.8%
Pharmaceutical and Medicine (3254)	11.2%	623	813	-23.3%

Note: Subsector percentages may not total 100 percent due to U.S. Census data withholding. Some subsectors may not be shown because of incomplete data. See Appendix A for more detailed South data and Appendix B for more detailed national data and additional notes.

§ *Source: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPag-eServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.*

** *The GDP–Material Input ratio is an important measure for determining the relative value of unit product shipment in the Southern region compared to the national average. Most importantly for this analysis, this ratio has an impact on energy intensity because energy intensity is a rate of energy use per dollar of GDP. When the GDP–Material Input ratio is lower than the national average, this indicates that energy intensity is artificially high due to relatively lower shipment value. The inverse is also true.*

synthetic dyes and pigments, and other basic organic and inorganic chemicals.

As a whole, the South's chemical manufacturing sector uses an astonishing 84 percent more energy to produce one dollar of GDP than the national average for this sector. Much of this disparity in energy intensity is not seen in Exhibit 6 due to data being withheld in certain subsectors. The energy intensity of the basic chemical manufacturing subsector in the South is 15 percent above the national average, and the production of resins, synthetic rubbers, and artificial synthetic fibers and filaments is more than 22 percent above the national average for this subsector. In the pharmaceuticals and medicines subsector, the South actually has an energy intensity that is 23 percent below the national average. While, as a whole, the Southern chemical industry's energy intensity is 83.8 percent above the national average, Exhibit 6 shows that the subsectors with available energy-intensity data do not reflect this same disparity. This implies that the subsector with the greatest difference from the national average in

energy intensity is one of the four subsectors where data has been withheld.

A portion of the high energy intensity is a result of the relatively low product value of Southern chemical shipments, which can be seen from the disparity between Southern and national GDP–Material Input ratios in Exhibit 7. Even after normalizing for this disparity in product value, the South's chemical manufacturing industry uses significantly more energy to produce its products compared to the rest of the nation. This is apparent from noting that the percentage difference between Southern and national GDP–Material Input ratios is smaller than the difference between their energy intensities. If the South's chemical manufacturing sector used energy at the same rate as the rest of the nation, the region could have reduced its consumption from 2,458 to 1,338 trillion Btu in 2006.

This 1,120-trillion Btu energy-consumption reduction is equivalent to the annual energy required to heat approximately 20 million households in the United

Exhibit 7: Chemical *GDP–Material Input* Ratio

| Description (NAICS Code)	South GDP–Material Input Ratio	National GDP–Material Input Ratio
Chemicals (325)	0.72	1.06
Basic Chemical Manufacturing (3251)	0.63	0.73
Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments (3252)	0.46	0.49
Pharmaceutical and Medicine (3254)	2.93	2.77
Soap, Cleaning Compound, and Toilet Preparation(3256)	0.60	0.96
Other Chemical Product and Preparation (3259)	0.73	0.92
Pesticide, Fertilizer, and Other Agricultural Chemical (3253)	0.85	0.97
Paint, Coating, and Adhesive (3255)	1.00	1.02

See Appendix A for more detailed South data and Appendix B for more detailed national data.

States.[i] The 1,120-trillion Btu reduction at the $10.99-per-million-Btu price level would have yielded approximately $12.3 billion in production-cost savings for the Southern chemical industry.

1.2. Printing and Related Support Activities (NAICS 323)

Although the South does not lead the nation in terms of value of shipments in the printing and related support activities sector, its activities comprise 26 percent of the national total, as shown in Exhibit 8. The South follows the Midwest in value of shipments, giving it the second largest printing sector in the nation with Texas accounting for nearly 20 percent and Florida accounting for over 12 percent of the region's total.[ii]

Exhibit 8: 2006 National Printing Production Shipments

(IN THOUSANDS OF DOLLARS)
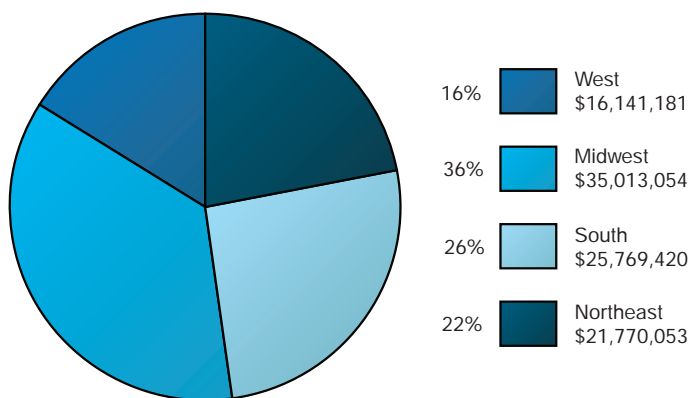
16%	West	$16,141,181
36%	Midwest	$35,013,054
26%	South	$25,769,420
22%	Northeast	$21,770,053

Source: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMain-PageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

The printing industry is comprised of only one four-digit NAICS subsector, making it equivalent to the three-digit-level totals. Exhibit 9 shows that the South has a regional energy intensity that is 72 percent above the national average energy intensity in the printing sector. The South's energy intensity also runs in stark contrast with that of the Midwest—the nation's printing sector leader—which has an energy intensity that is only 2 percent above the national average.

Although the printing industry is not one of the largest industries in the South in terms of value of shipments, its energy intensity is so far above the national average that it is one of the top sectors for the South in terms of capacity to recapture savings through energy-intensity improvements.

A portion of the high energy intensity is a result of the relatively low product value of Southern printing shipments, which can be seen from the disparity between Southern and national *GDP–Material Input* ratios (Exhibit 10).

Exhibit 10: Printing *GDP–Material Input* Ratio

Description (NAICS code)	West *GDP–Material Input* Ratio	National *GDP–Material Input* Ratio
Printing and Related Support Activities (323)	1.44	1.52

See Appendix A for more detailed West data and Appendix B for more detailed national data.

Exhibit 9: 2006 Southern Printing Production Summary

Description (NAICS Code)	Percentage of Total Shipments	Estimated South Energy Intensity (Btu/$GDP)	Estimated National Energy Intensity (Btu/$GDP)	Percent above or below National Average
Printing and Related Support Activities (323)	100.0%	2,420	1,408	71.9%

Note: Subsector percentages may not total 100 percent due to U.S. Census data withholding. Some subsectors may not be shown because of incomplete data. See Appendix A for more detailed South data and Appendix B for more detailed national data and additional notes.

Despite this product value disparity, the South's printing industry uses significantly more energy to produce its products compared to the rest of the nation. If the South's printing sector used energy at the same rate as the rest of the nation, the region could have reduced its consumption from 37 to 22 trillion Btu in 2006. This 15-trillion Btu energy-consumption reduction is equal to the amount of energy produced by over 900 1.5-megawatt wind turbines.[iii] It also would have yielded $164 million in production-cost savings for the Southern printing industry.

1.3. Paper Manufacturing (NAICS 332)

Paper manufacturing is another energy-intensive industry in which the South leads the nation. The Southern United States is often noted on both a national and international level for its scale of paper production and quantity of tree farms. Paper manufacturing in the South accounts for 42 percent of the nation's total paper manufacturing shipments, as shown in Exhibit 11. Georgia, Alabama, North Carolina, and Texas were the largest contributors in the region in 2006.[iv]

Exhibit 11: 2006 National Paper Manufacturing Shipments
(IN THOUSANDS OF DOLLARS)
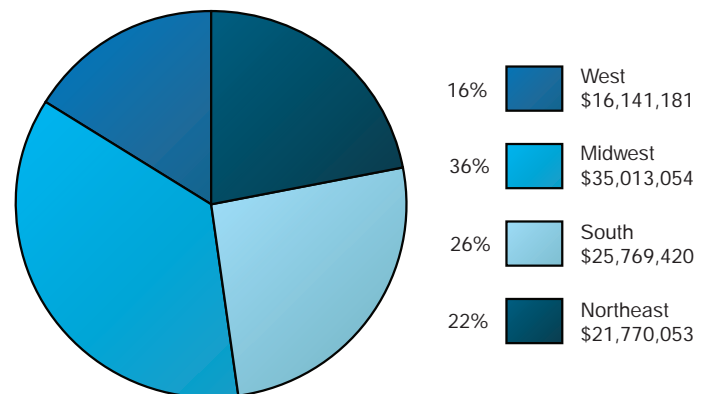
16%	West $16,141,181
36%	Midwest $35,013,054
26%	South $25,769,420
22%	Northeast $21,770,053

Source: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMain-PageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

The paper industry comprises two subsectors: pulp, paper, and paperboard mills and converted paper product manufacturing. Exhibit 12 shows the large disparity between the South's energy intensity in paper manufacturing compared with the national

Exhibit 12: 2006 Southern Paper Manufacturing Summary

Description (NAICS Code)	Percentage of Total Shipments	Estimated South Energy Intensity (Btu/$GDP)	Estimated National Energy Intensity (Btu/$GDP)	Percent above or below National Average
Paper (322)	100.0%	47,200	29,468	60.2%
Pulp, Paper, and Paperboard Mills (3221)	54.4%	—	49,120	—
Converted Paper Products (3222)	43.8%	—	—	—

Note: Subsector percentages may not total 100 percent due to U.S. Census data withholding. Some subsectors may not be shown because of incomplete data. See Appendix A for more detailed South data and Appendix B for more detailed national data and additional notes.

average. The South has an energy intensity that is 60 percent above the national average.

Exhibit 13: Paper
GDP–Material Input Ratio

Description (NAICS code)	South *GDP–Material Input* Ratio	National *GDP–Material Input* Ratio
Paper (322)	0.91	0.90
Pulp, Paper, and Paperboard Mills (3221)	1.10	1.11
Converted Paper Products (3222)	0.72	0.74

See Appendix A for more detailed South data and Appendix B for more detailed national data.

If the South's paper manufacturing sector operated with the national average energy intensity, it would have consumed 980 trillion Btu instead of 1,570 trillion Btu to produce the same amount of goods in 2006. This would result in 590 trillion Btu in energy savings, which is equivalent to the annual energy necessary to heat approximately 10.5 million households in the United States.[v] This reduction in energy consumption would have yielded $6.5 billion in energy savings that year.

1.4. Textile Product Mills (NAICS 314)

The South is historically associated with the textile industry and accounts for 70 percent of all textile product mills in the United States (Exhibit 14).

Within the Southern region, Georgia holds a commanding lead of the sector with over $12 trillion in product value shipped, which is six times more than North Carolina, the second largest producer in the region.[vi]

Exhibit 14: 2006 National Textile Product Mills Shipments
(IN THOUSANDS OF DOLLARS)

10%	West $3,322,493
9%	Midwest $2,735,095
70%	South $22,290,390
11%	Northeast $3,349,553
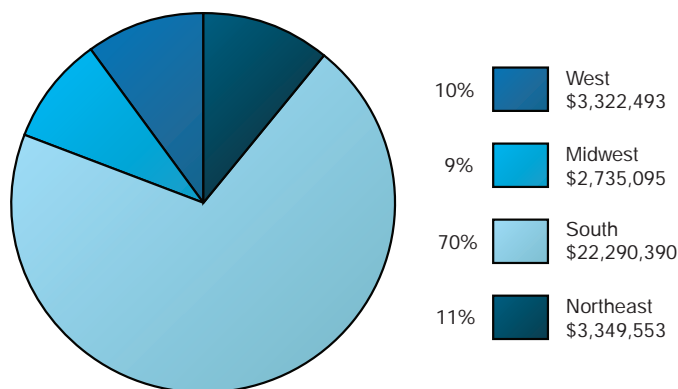
Source: Census, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabld=EAS1&_submenuld=datasets_5&_lang=en&_ts=266925692376.

The textile products industry includes two general subsectors—textile furnishings and other textile products. These subsectors include the production of rugs, carpets, linens, drapes, bags, canvas, and rope. The South's energy intensity in the textile products industry is almost 42 percent above the national average, as shown in Exhibit 15.

This disparity in energy intensity means the South uses 42 percent more energy to produce one dollar of GDP than the national average for this sector. This 42-percent difference in intensity is also significant

Exhibit 15: 2006 Southern Textile Product Mills Summary

Description (NAICS Code)	Percentage of Total Shipments	Estimated West Energy Intensity (Btu/$GDP)	Estimated National Energy Intensity (Btu/$GDP)	Percent above National Average
Textile Product Mills (314)	100.0%	6,737	4,762	41.5%

Note: Subsector percentages may not total 100 percent due to U.S. Census data withholding. Some subsectors may not be shown because of incomplete data. See Appendix A for more detailed South data and Appendix B for more detailed national data and additional notes.

because such a large share of the textile products industry is located in the South. The energy intensity in this region has a large impact on the overall national average. Although data from the Midwest was withheld, its energy intensity can be calculated from the national average data in conjunction with the available data from the Northeast, South, and West.[vii] This calculation indicates that the Midwest has a higher energy intensity (about 8,500 trillion Btu per dollar of GDP) in textile products than the South, but the Midwest's 9-percent share value of shipments for textile product mills is small compared to the South's 70-percent share. This means that despite having a slightly lower energy intensity than the Midwest, the South has a much greater capacity to save energy and capture financial returns from the savings through improvements in energy intensity.

Exhibit 16: Textile Product Mills
GDP–Material Input Ratio

Description (NAICS code)	South GDP–Material Input Ratio	National GDP–Material Input Ratio
Textile Product Mills (314)	0.76	0.83
Textile Furnishings Mills (3141)	0.72	0.74
Other Textile Product Mills (3149)	0.98	1.04

See Appendix A for more detailed South data and Appendix B for more detailed national data.

A portion of the high energy intensity is a result of the relatively low product value of Southern textile product shipments, which can be seen from its lower–than-average *GDP–Material Input* ratio in Exhibit 16. Even after normalizing for this product value disparity, the South's textile product mills industry uses significantly more energy to produce its products than the national average. If the South's textile product mills used energy at the same rate as the rest of the nation, the region could have reduced its consumption from 65 to 46 trillion Btu in 2006. This energy savings of 19 trillion Btu is equivalent

to 7 percent of the energy consumption of the state of South Dakota.[viii] The 19 trillion Btu in energy consumption reduction would have yielded $209 million in production-cost savings for the Southern textile products industry.

1.5. Plastics and Rubber Products Manufacturing (NAICS 326)

Another important industry in which the South leads the nation in manufacturing is plastics and rubber products. The South's 38-percent share of the industry exceeds the Midwest's 36-percent share by nearly $4.5 billion in value of shipments, as shown in Exhibit 17. Texas' plastics and rubber product manufacturing alone comprises nearly 18 percent of the region's total, with North Carolina as the next leading contributor at 12 percent.[ix]

Exhibit 17: 2006 National Plastics and Rubber Manufacturing Shipments
(IN THOUSANDS OF DOLLARS)
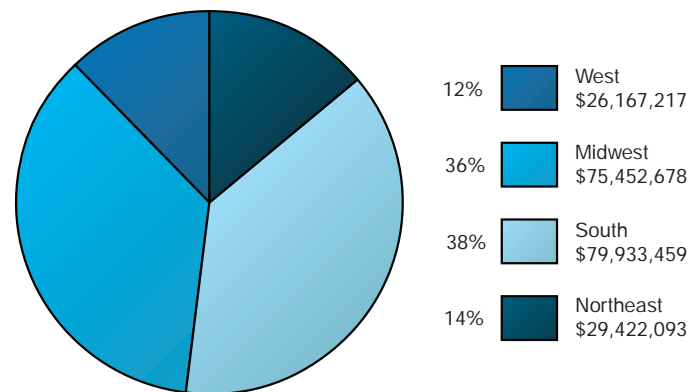
12%	West $26,167,217
36%	Midwest $75,452,678
38%	South $79,933,459
14%	Northeast $29,422,093

Source: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMain-PageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

The South's plastics and rubber products manufacturing is the aggregate of two subsectors: plastic product manufacturing and rubber product manufacturing. Exhibit 18 provides additional information about the subsectors, revealing that the South's energy intensity in plastics and rubber manufacturing is nearly 16 percent above the national average.

Exhibit 18: 2006 Southern Plastics and Rubber Products Manufacturing Summary

Description (NAICS Code)	Percentage of Total Shipments	Estimated South Energy Intensity (Btu/$GDP)	Estimated National Energy Intensity (Btu/$GDP)	Percent above or below National Average
Plastics and Rubber Products (326)	100.0%	3,884	3,358	15.6%

Note: Subsector percentages may not total 100 percent due to U.S. Census data withholding. Some subsectors may not be shown because of incomplete data. See Appendix A for more detailed South data and Appendix B for more detailed national data and additional notes.

The plastics and rubber industry in the South uses 16 percent more energy to produce one dollar of GDP than the national average for this sector. A portion of the high energy intensity is partially a result of the relatively low product value of Southern plastic and rubber product shipments, which can be seen from its *GDP–Material Input* ratio being lower than the national average, as shown in Exhibit 19. Despite this product value disparity, the South's plastics and rubber industry uses more energy to produce its

Exhibit 19: Plastics and Rubber Products *GDP–Material Input* Ratio

Description (NAICS code)	South GDP–Material Input Ratio	National GDP–Material Input Ratio
Plastics and Rubber Products (326)	0.80	0.88
Plastics Products (3261)	0.82	0.90
Rubber Products (3262)	0.72	0.82

See Appendix A for more detailed West data and Appendix B for more detailed national data.

If the South's plastics and rubber manufacturers used energy at the same rate as the national average, the region could have reduced its consumption from 139 to 120 trillion Btu in 2006, resulting in a 19-trillion Btu energy-consumption reduction. This 19 trillion Btu in savings would have theoretically avoided the

need for two 500-megawatt power plants. It also would have yielded $209 million in production-cost savings for the Southern plastics and rubber products industry.required to heat 1.2 million households in the United States.[14] The 67-trillion Btu would also have yielded approximately $852 million in production–cost savings for the West's petroleum and coal products industry.

2. Moving Forward

The South's large potential for efficiency improvements in its manufacturing sector should be viewed as a significant energy resource. The nation-leading industries discussed in this report could reduce operating costs significantly by lowering energy intensities to national average levels. A summary of additional benefits is in the box to the right.

It should be emphasized that the energy and economic savings estimated in this report are based on the South merely lowering its energy intensities to the national average that existed in 2006. These estimates do not include the possible savings that could result from the South implementing additional energy efficiency improvements that would allow it to lead the nation in these sectors in terms of energy intensity. As mentioned, if the South's energy intensities were at parity with the national average in these five industries, the South would have reduced energy consumption by 1,763 trillion Btu and saved more than $19.4 billion in the process. The 1,763 trillion Btu in energy savings is equivalent to the annual energy required to heat 31.4 million households in the United States.[x] Exhibit 20 shows the 2006 energy consumption of each of the five sectors detailed in this report, along with the potential energy savings and energy consumption if these sectors were to operate with energy intensities equal to the national average for each sector. Additional savings can be realized by moving below national average levels to lead in energy efficiency, as well as product shipments.

ADDITIONAL BENEFITS

- Reducing short-term manufacturer energy costs by lowering energy bills through conservation
- Increasing manufacturer competitiveness through reduced operating costs
- Reducing long-term manufacturer energy costs by reducing spending on generation and transmission
- Insulating Southern manufacturing sectors from fossil-energy price volatility and shocks
- Reducing utility investment risk by using energy efficiency measures instead of traditional energy supply
- Meeting state and national utility goals for energy resource and greenhouse gas emissions.

The South can become a national leader in energy intensity by making changes to the way it consumes energy. Utilities, government organizations, nongovernmental organizations, and energy consumers must make an effort to support programs that reduce energy consumption, save money, and increase industry competitiveness. Improving processes and reducing energy consumption will help the South continue its position as a global manufacturing leader.

Exhibit 20: Potential Energy and Economic Savings with
National Average Energy Intensities

Manufacturing Sector Description	Energy Saved in Trillion Btus, If at National Average	Economic Savings in Millions
Chemicals (NAICS 325)	1,120	$12,313
Printing & Related Support Activities (NAICS 323)	15	$170
Paper (NAICS 322)	590	$6,482
Textile Product Mills (NAICS 314)	19	$209
Plastic & Rubber Products (NAICS 326)	19	$207

3. Appendices

Appendix A: Southern Manufacturing Sector and Subsector Details

NAICS Code	Description	Material Inputs ($1,000)	Value of Shipments ($1,000)	GDP ($1,000)	Energy Consumed (Trillion Btu)	Energy Intensity (Btu/$GDP) β	GDP–Material Input Ratio
314	Textile Product Mills	$12,668,993	$12,668,993	$9,648,400	65	5,081	0.76
3141	Textile Furnishings Mills	$9,687,155	$9,687,155	$6,968,806	—	—	0.72
3149	Other Textile Product Mills	$2,342,080	$4,655,403	$2,297,241	—	—	0.98
322	Paper	$36,505,440	$69,716,583	$33,262,971	1,570	5,391	0.91
3221	Pulp, Paper, and Paperboard Mills	$18,018,128	$37,892,407	$19,903,952	—	—	1.10
3222	Converted Paper Products	$17,713,061	$30,509,955	$12,804,692	—	—	0.72
323	Printing and Related Support Activities	$10,599,672	$25,769,420	$15,288,161	37	2,420	1.44
325	Chemicals	$200,313,912	$342,698,414	$143,986,684	2,458	17,071	0.72
3251	Basic Chemicals	$93,285,391	$151,928,567	$59,141,388	1,593	26,935	0.63
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments	$49,711,131	$71,413,200	$22,987,067	609	26,493	0.46
3253	Pesticide, Fertilizer, and Other Agricultural Chemicals	$6,214,862	$11,582,424	$5,274,823	—	—	0.85
3254	Pharmaceuticals and Medicines	$9,848,398	$38,543,807	$28,888,345	18	623	2.93
3255	Paint, Coating, and Adhesives	$4,825,510	$9,657,886	$4,839,964	—	—	1.00

NAICS Code	Description	Material Inputs ($1,000)	Value of Shipments ($1,000)	GDP ($1,000)	Energy Consumed (Trillion Btu)	Energy Intensity (Btu/$GDP) β	GDP–Material Input Ratio
3256	Soap, Cleaning Compound, and Toilet Preparations	$13,067,150	$20,756,993	$7,796,365	—	—	0.60
3259	Other Chemical Product and Preparations	$6,763,955	$11,689,241	$4,945,779	—	—	0.73
326	Plastics and Rubber Products	$44,671,647	$79,933,459	$35,791,976	139	3,884	0.80
3261	Plastics Products	$34,161,385	$61,775,278	$28,161,575	—	—	0.82
3262	Rubber Products	$10,357,309	$17,858,168	$7,481,684	—	—	0.72

β Values are estimates and may be slightly over or understated due to Census and EIA data availability.

Sources: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376. EIA, 2006 Manufacturing Energy Consumption Survey, Table 1.2. www.eia.doe.gov/emeu/mecs/mecs2006/2006tables.html.

Appendix B: National Manufacturing Sector and Subsector Details

NAICS Code	Description	Material Inputs ($1,000)	Value of Shipments ($1,000)	GDP ($1,000)	Energy Consumed (Trillion Btu)	Energy Intensity (Btu/$GDP) ς	GDP–Material Input Ratio
314	Textile Product Mills	$18,195,141	$33,264,437	$15,120,934	72	4,762	0.83
3141	Textile Furnishings Mills	$12,647,839	$21,916,681	$9,353,523	--	--	0.74
3149	Other Textile Product Mills	$5,547,302	$11,347,756	$5,767,411	--	--	1.04
322	Paper	$89,293,248	$169,032,996	$79,951,815	2,356	29,468	0.90
3221	Pulp, Paper, and Paperboard Mills	$37,463,210	$78,925,576	$41,530,653	2,040	49,120	1.11
3222	Converted Paper Products	$51,830,038	$90,107,420	$38,421,161	--	--	0.74

NAICS Code	Description	Material Inputs ($1,000)	Value of Shipments ($1,000)	GDP ($1,000)	Energy Consumed (Trillion Btu)	Energy Intensity (Btu/$GDP) ς	GDP– Material Input Ratio
323	Printing and Related Support Activities	$39,718,051	$99,799,653	$60,356,803	85	1,408	1.52
325	Chemicals	$320,564,238	$657,082,332	$340,038,095	3,159	9,290	1.06
3251	Basic Chemicals	$113,057,852	$195,006,868	$82,690,075	1,941	23,473	0.73
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments	$63,673,791	$94,313,037	$31,494,112	685	21,750	0.49
3253	Pesticide, Fertilizer, and Other Agricultural Chemicals	$13,717,061	$27,147,139	$13,290,256	147	11,061	0.97
3254	Pharmaceuticals and Medicines	$48,457,084	$180,933,996	$134,143,191	109	813	2.77
3255	Paint, Coating, and Adhesives	$16,511,690	$33,273,668	$16,854,845	--	--	1.02
3256	Soap, Cleaning Compound, and Toilet Preparations	$43,441,517	$84,667,389	$41,518,238	--	--	0.96
3259	Other Chemical Product and Preparations	$21,705,242	$41,740,236	$20,047,377	--	--	0.92
326	Plastics and Rubber Products	$112,779,031	$211,299,202	$99,450,731	334	3,358	0.88
3261	Plastics Products	$92,316,532	$174,142,635	$82,761,826	--	--	0.90
3262	Rubber Products	$20,462,499	$37,156,567	$16,688,906	--	--	0.82

ς Values are estimates and may be slightly over or understated due to Census and EIA data availability.

Sources: U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPag-eServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376. EIA, 2006 Manufacturing Energy Consumption Survey, Table 1.2. www.eia.doe.gov/emeu/mecs/mecs2006/2006tables.html.

4. Endnotes

[i] Energy Information Administration, Annual Energy Outlook, Table 4. http://www.eia.doe.gov/oiaf/aeo/pdf/aeotab_4.pdf

[ii] U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

[iii] http://www.gepower.com/prod_serv/products/wind_turbines/en/15mw/index.htm and http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/renewable.pdf

[iv] U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

[v] Energy Information Administration, Annual Energy Outlook, Table 4. http://www.eia.doe.gov/oiaf/aeo/pdf/aeotab_4.pdf

[vi] U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

[vii] U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

[ix] http://www.eia.doe.gov/emeu/aer/txt/ptb0106.html

[x] U.S. Census Bureau, 2006 Annual Survey of Manufactures, Stats for All Mfg by State. http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=EAS&_tabId=EAS1&_submenuId=datasets_5&_lang=en&_ts=266925692376.

[xi] Energy Information Administration, Annual Energy Outlook, Table 4. http://www.eia.doe.gov/oiaf/aeo/pdf/aeotab_4.pdf