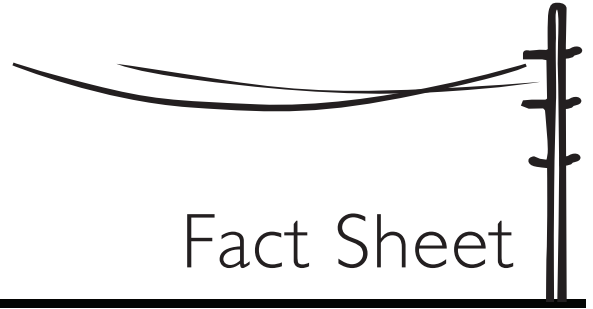




WOOD ^{to} ENERGY



Fact Sheet

Economic Impacts of Generating Electricity

Alan W. Hodges & Mohammad Rahmani

Electric power is an increasingly important aspect of modern society. We are extremely dependent on electricity for many uses, such as heating, cooling, lighting, and information technology. If woody biomass can be used for small- to medium-scale power plants instead of or along with fossil fuels, local resources can be used and more money can be retained in the area. Use of renewable fuels such as woody biomass also provides significant environmental benefits by reducing pollution and carbon emissions.

Biomass energy facilities are costly investments that could represent a substantial financial burden to a community. However, they can bring significant benefits to other parts of the local economy, such as new opportunities for landowners to sell wood, new strategies for reducing waste, and new local jobs. Therefore, such

facilities require careful consideration by policy-makers, industry leaders, and the public at large. This fact sheet provides some general information about the overall economic benefits and impacts that may accompany these facilities.

Maintaining Local Economies – A General Model

Figure 1 illustrates the structure of a local economy with a woody biomass energy sector and the links that impact a local economy. The businesses in the wood energy sector (such as timber growers, loggers, and electric power producers) sell their products and services to final consumers through wholesale and retail distributors, and to other businesses, both within the local economy (A)

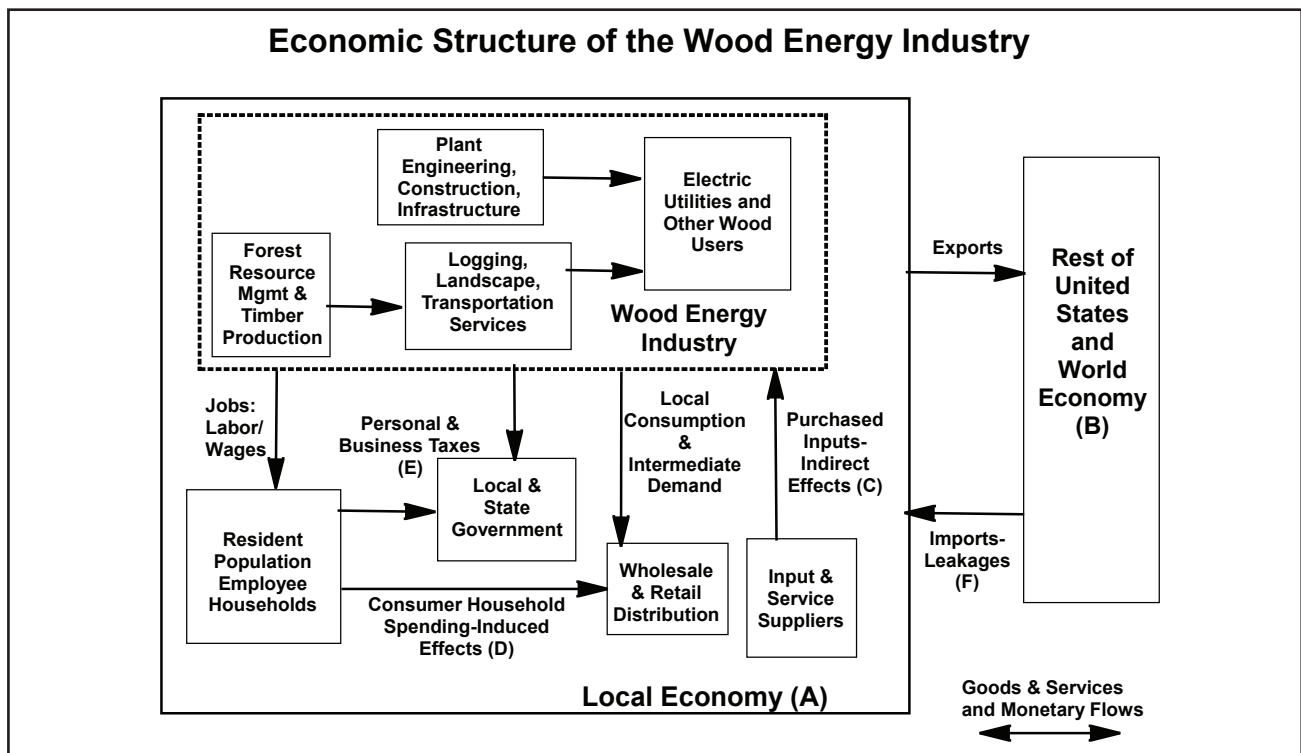


Figure 1. Structure and economic impacts of wood-fueled electric power generation in a local economy.

and to the rest of the national and world economy (B). Firms that purchase wood and other materials from local suppliers generate economic activity through recirculation of money in the local economy (C). Households of employees spend their earnings for personal consumption of items such as food, clothing, housing, and transportation, which further increases local economic activity (D). Also, both businesses and households pay taxes to local governments (E). Eventually money leaves the local economy for purchase of goods and services not available locally, outside investments or federal taxes (F); this is known as “leakage.” The more raw materials (such as wood) that are obtained locally, the greater the increase in the local economy because less leakage occurs. If fossil fuels are imported from another state, comparatively little local economic activity is created by a power plant that uses them.

Community Economic Profiles

The specific ways in which a local economy may be affected by the development of a biomass energy facility vary widely from community to community. In order to provide an idea of these effects, we have evaluated the economic impacts for a number of communities in the southeastern United States that appear to be well suited for the development of some level of woody biomass energy. Although not all of these communities would be able to support a 20 or 40 megawatt (MW) power plant, we use this projection to help compare these counties. The details of how these communities were chosen and the specific procedures involved in the estimation of the economic impacts of fuel costs are discussed in the background resources for community economic profiles on our Web site <http://interfacesouth.org/woodybiomass>. This fact sheet provides a discussion of the results of these analyses.

Construction and Operations of Facility

Economic impacts were calculated for two levels of development: a 20 MW plant and a 40 MW plant. The initial impacts of the project were from the one-time construction activity, calculated to occur within a year. The impacts of plant operations were calculated to recur annually. Total site acquisition and construction costs were valued at \$48.7 million for the 20 MW plant and \$86.8 million for the 40 MW plant, including land, site work, building, plant equipment, and engineering fees. The largest construction expense items were the boilers and turbines, which cost between \$45 million and \$90 million. The total annual operating expenses (first year)

for a wood-fueled power plant averaged \$8.0 million for 20 MW and \$16.1 million for 40 MW. Fuel typically represents the largest operating cost for a facility. These costs varied significantly across the selected counties due to differences in availability of forest and wood waste resources and transportation infrastructure. Fuel costs averaged \$4 or \$9.8 million for the 20 or 40 MW plants, respectively, and ranged from \$5.7 million to nearly \$13 million for the 40 MW plant (Table 1).

Economic Impact Results

The estimated economic impacts resulting from the construction phase of power plant development in each of the counties are summarized in Table 2. Total output impacts for a 20 MW power plant ranged from \$2.8 million to \$45.3 million. This impact includes all of the purchases (such as food, clothing, and gasoline) that people are able to make because their wages are tied to the power plant (Box 1). Employment impacts ranged from 27 to 379 jobs; however, some of these jobs were a result of the increased economic activity that the facility and the use of local fuel brought to the community. The value-added impacts, or change in total personal and business income, ranged from \$1.7 million to \$25.9 million. For a 40 MW power plant, output impacts ranged from \$3.8 million to \$78.7 million, employment impacts from 39 to 653 jobs, and value added impacts from \$2 million to \$44.9 million. The large differences among counties were due to the fact that some counties had local sources for purchase of the major capital items, while in other cases these items had to be imported from other regions, which represented leakage from the local economy.

The economic impacts of annual operations in one year for power plants in each county are summarized in Table 3. Total output impacts for a 20 MW plant averaged \$10.57 million and ranged from \$2.8 million to \$14.4 million; employment impacts averaged 170 jobs and ranged from 27 to 266 jobs; value added impacts averaged \$6.3 million and ranged from \$1.7 million to \$8.6 million. For a 40 MW plant, total output impacts averaged \$21.7 million and ranged from \$4.6 million to \$31.5 million; employment impacts averaged 370 jobs and ranged from 43 to 629 jobs; value added impacts averaged \$13 million and ranged from \$2.8 million to \$18.9 million. These results for plant operations would be permanent recurring annual impacts. Again, the impacts varied widely among counties, due to differences in the specific makeup of the local economy, and, in some cases, the absence of key sectors serving wood-fired power plant operations.

Table 1. Biomass Fuel Costs for 20 and 40 MW Power Plants in Selected Southern U.S. Counties

County, State	20 MW (million \$)	40 MW (million \$)
Lee, AL	4.00	9.55
Shelby, AL	4.03	10.37
Saline, AR	4.85	11.44
Union, AR	5.02	10.91
Alachua, FL	3.84	9.28
Clay, FL	3.37	9.05
Leon, FL	4.52	10.57
Nassau, FL	3.69	9.46
Santa Rosa, FL	4.70	11.23
Coweta, GA	2.61	6.12
Douglas, GA	2.47	5.70
Murray, GA	3.70	8.70
Union, GA	4.76	11.65
Laurel, KY	4.48	10.52
Trimble, KY	3.57	8.79
Livingston, LA	3.62	9.10
DeSoto, MS	3.56	9.80
Warren, MS	4.62	10.52
Buncombe, NC	3.74	9.37
Orange, NC	2.88	7.37
Le Flore, OK	5.88	12.97
Oconee, SC	4.08	10.30
Anderson, TN	4.53	11.58
Blount, TN	4.64	11.97
Sevier, TN	4.64	12.10
Montgomery, TX	2.81	6.43
Chesterfield, VA	3.81	10.22
Fluvanna, VA	4.06	10.04
Average	4.01	9.83

Table 2. Capital Construction Impacts for a 20 or 40 MW Wood-Fueled Power Plant in Selected Southern U.S. Counties

County, State	20 MW Plant			40 MW Plant		
	Output (\$Mn)	Employment (Jobs)	Value Added (\$Mn)	Output (\$Mn)	Employment (Jobs)	Value Added (\$Mn)
Lee, AL	5.0	60	2.9	6.0	72	3.4
Shelby, AL	40.9	317	18.9	71.2	549	32.5
Saline, AR	4.1	52	2.3	4.9	61	2.7
Union, AR	4.0	46	2.3	4.8	55	2.7
Alachua, FL	8.0	81	4.3	10.8	107	10.8
Clay, FL	7.6	74	3.7	10.3	98	4.8
Leon, FL	7.8	74	4.1	10.7	100	5.4
Nassau, FL	6.7	63	3.3	9.0	82	4.2
Santa Rosa, FL	37.7	335	15.4	65.5	578	26.3
Coweta, GA	7.5	49	2.7	5.6	59	3.1
Douglas, GA	7.6	69	3.6	10.2	90	4.6
Murray, GA	3.1	31	1.7	3.8	39	2.0
Union, GA	4.0	47	2.2	4.8	57	2.6
Laurel, KY	4.5	54	2.6	5.4	64	3.1
Trimble, KY	2.8	27	1.7	4.6	43	2.7
Livingston, LA	35.0	293	17.2	61.2	504	29.9
De Soto, MS	4.8	59	2.7	5.8	70	3.1
Warren, MS	4.4	54	2.4	5.2	64	2.8
Buncombe, NC	7.9	74	3.9	10.7	98	10.7
Orange, NC	45.3	379	25.9	78.7	653	44.9
La Flore, OK	5.8	65	2.5	7.8	83	3.0
Oconee, SC	4.2	45	2.4	5.0	54	2.8
Anderson, TN	6.7	57	3.6	9.1	76	4.7
Blount, TN	4.9	48	3.0	5.9	58	3.6
Sevier, TN	6.7	59	3.5	11.5	229	7.0
Montgomery, TX	7.8	64	4.1	10.6	85	5.4
Chesterfield, VA	43.8	222	22.1	76.2	372	38.2
Fluvanna, VA	3.9	40	2.1	4.7	50	2.5
Average	11.9	101	6.0	18.6	159	9.6

Box 1: Understanding the Terms

Total output impacts—the effect on sales revenues of all businesses in a local economy resulting from the proposed change in industry activity.

Value added impacts—the effect on personal and business income in the local area.

Employment impacts—the effect on the total number of full-time, part-time and seasonal positions in the local area.

Often it is helpful to predict the distribution of economic impacts across various sectors of the local economy. The estimated average employment impacts of annual operations for a 40 MW power plant are shown by major industry group in Table 4. A large employment impact, averaging 226 jobs, or more than 60 percent of all jobs, would occur in the agriculture and forestry sector, which supplies wood fuel to these plants. There were also significant employment impacts in the sectors for professional services (27 jobs), retail trade (19 jobs), and government (22 jobs), reflecting the indirect and induced effects on the local economy.

Conclusions

Based on the 28 counties and parishes included in this analysis, we can make the following conclusions:

Construction and operation of wood-fueled power plants may have significant local economic impacts, but these impacts varied widely among selected counties, depending upon the particular make-up of the local economy.

Wood fuel represents one of the largest expenditures for a power plant, and results in large impacts in the local forestry and forestry services sectors. Other sectors of the local economy are also impacted through supply chain purchases and employee spending.

Economic impacts of a 40 MW power plant are greater than for a 20 MW plant, although not in proportion to the power output, due to economies of scale.

For more information about using wood to produce energy, visit <http://www.interfacesouth.org/woodybiomass> and read other fact sheets, community economic profiles, and case studies from this program, or <http://www.forestbioenergy.net/> to access a number of other resources.

Authors

Alan W. Hodges, Associate Extension Scientist, and Mohammad Rahmani, Coordinator of Economic Analysis, Food and Resource Economics Department, University of Florida, Gainesville, FL.

Table 3. Annual Operating Impacts (First Year) for a 20 or 40 MW Wood-Fueled Power Plant in Selected Southern U.S. Counties

County, State	20 MW Plant			40 MW Plant		
	Output (Million \$)	Employment (Jobs)	Value Added (Million \$)	Output (Million \$)	Employment (Jobs)	Value Added (Million \$)
Lee, AL	12.40	210	7.63	25.25	447	15.69
Shelby, AL	11.35	125	7.28	24.33	276	15.76
Saline, AR	11.75	239	6.98	24.24	522	14.47
Union, AR	12.84	226	7.39	25.18	461	14.51
Alachua, FL	13.52	196	8.38	27.54	413	17.08
Clay, FL	11.73	182	7.10	25.30	420	15.35
Leon, FL	13.41	156	8.55	27.14	318	17.35
Nassau, FL	10.80	137	6.71	23.06	297	14.56
Santa Rosa, FL	12.47	147	7.70	25.94	307	16.18
Coweta, GA	9.51	160	5.52	18.41	331	10.71
Douglas, GA	7.96	75	4.46	14.21	130	7.84
Murray, GA	6.22	54	3.09	11.99	100	5.73
Union, GA	11.28	214	6.81	24.34	482	14.82
Laurel, KY	12.33	240	7.02	25.23	519	14.34
Trimble, KY	2.83	27	1.71	4.57	43	2.75
Livingston, LA	9.64	158	5.73	20.38	349	12.19
De Soto, MS	8.27	155	5.18	16.70	356	10.83
Warren, MS	11.87	182	7.12	23.74	375	14.30
Buncombe, NC	12.84	242	7.59	26.65	546	15.77
Orange, NC	10.81	177	6.91	22.08	393	14.07
La Flore, OK	8.22	85	3.88	15.78	155	7.38
Oconee, SC	10.76	220	5.98	23.16	508	12.86
Anderson, TN	11.51	216	6.94	24.96	510	15.08
Blount, TN	14.40	266	8.63	31.48	629	18.91
Sevier, TN	8.90	216	5.65	18.24	509	11.94
Montgomery, TX	11.32	154	6.79	21.73	314	13.03
Chesterfield, VA	13.08	187	7.84	28.46	437	17.07
Fluvanna, VA	9.56	218	5.51	20.42	501	11.89
Average	10.57	169.61	6.31	21.67	370.12	13.00

Table 4. Average Employment Impacts by Industry Group for Annual Operations (First Year) of a 40 MW Wood-Fueled Power Plant

Industry Group (NAICS)*	Average Number Jobs	Percent of Total Jobs
11 Agriculture, Forestry, Fishing & Hunting	226	61.2%
21 Mining	0	0.0%
22 Utilities	1	0.4%
23 Construction	8	2.1%
31-33 Manufacturing	2	0.6%
42 Wholesale Trade	3	0.9%
44-45 Retail Trade	19	5.2%
48-49 Transportation & Warehousing	2	0.6%
51 Information	1	0.3%
52 Finance & Insurance	7	1.9%
53 Real estate & Rental	5	1.4%
54 Professional, Scientific & Technical Services	27	7.2%
55 Management of Companies	1	0.4%
56 Administrative & Waste Services	7	1.9%
61 Educational Services	1	0.3%
62 Health & Social Services	12	3.1%
71 Arts, Entertainment & Recreation	2	0.5%
72 Accommodation & Food Services	12	3.2%
81 Other Services	9	2.6%
92 Government & Non-NAICs	22	6.0%
Total All Industries	370	100.0%

*North American Industry Classification System



COOPERATIVE EXTENSION SERVICE, UNIVERSITY OF FLORIDA, INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES, Larry R. Arrington, Director, in cooperation with the United States Department of Agriculture, publishes this information to further the purpose of the May 8 and June 30, 1914 Acts of Congress; and is authorized to provide research, educational information, and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions, or affiliations. The information in this publication is available in alternate formats. Single copies of extension publications (excluding 4-H and youth publications) are available free to Florida residents from county extension offices. Information about alternate formats is available from IFAS Communication Services, University of Florida, PO Box 110810, Gainesville, FL 32611-0810. This information was published September 2007. FOR-136