An Economic Impact Analysis of a Large-Scale (533 WTPD) Biomass Gasification Facility on Georgia's Economy

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I. INTRODUCTION

An economic impact analysis can evaluate the effects, or economic impacts, of a new venture – in this case a large-scale (533 WTPD) biomass gasification facility – on major sectors of the economy. This economic impact analysis measures the projected economic impacts of this facility due to economic activity associated with both its construction and operations-related activities on the state economy of Georgia.

IMPLAN, an economic input-output modeling program, was utilized in this project. IMPLAN can interpret the effects of a new venture in a number of ways including output (sales), labor income (employee compensation and proprietary income), employment (jobs), and tax revenue. Further, the IMPLAN model can be constructed for the economy of a single county, state, or multi-county or state region. In general, input-output models work by separating the economy into its various sectors, such as agriculture, construction, manufacturing, trade, and so forth. The model then captures how a change in one industry (for example, Renewable Energy Generation) will change output, labor income, and employment in other industries in terms of direct, indirect, and induced effects.

- *Direct effects* represent the initial impact on the economy of some feature (i.e. construction or operations) of a new venture.

- *Indirect effects* are changes in other industries caused by the direct effect of a new venture.

- *Induced effects* are changes in household spending due to the changes in economic activity generated by both the direct and indirect effects.

Thus, the total economic impact is nothing more than the sum of the direct, indirect, and induced effects.

II. CONSTRUCTION-RELATED ECONOMIC IMPACTS

Any economic impact analysis of a new venture would be remiss to not first evaluate the economic benefits to the economy due to construction-related expenditures. Construction-related expenditures also include the purchase and installation of all operational equipment such as that related to the gasification technology and all feedstock receiving and processing equipment. In sum, capital costs of a 533 WTPD biomass gasification facility are projected to be nearly $38 million.

Economic Impact of Construction on Georgia's Economy

First, the projected economic impacts of the gasification facility's construction and equipment purchases and installation on Georgia's economy are estimated. Table 1 highlights the economic impact of this economic activity with regard to output, labor income, employment, and tax revenue.

Table 1:
533 WTPD Construction --- Projected Economic Benefits to Georgia's Economy
(all Georgia counties included)

	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Output	$37,885,000	$12,499,139	$10,745,663	$61,129,802
Labor Income	$9,062,982	$4,640,745	$3,622,138	$17,325,865
Employment	210	100	113	423
Tax				$2,019,095

As shown in Table 1, the direct effect of the facility's construction-related activities is nearly $38 million. This figure represents the total projected construction cost of all buildings and purchase of feedstock receiving and processing equipment. The infusion of this $38 million in the state's economy generates an additional, indirect effect of approximately $12.5 million in output (sales) from supporting industries throughout Georgia. The indirect effect represents business to business purchases between businesses constructing the facility and their supplying, or supporting, businesses (i.e., purchasing building materials and services). In addition, the construction project will induce nearly $11 million in sales as construction personnel and area employees spend the income they receive; either directly or indirectly on consumer products and services. The total economic impact on Georgia's economy, resulting from the construction project, is more than $61 million. Remember, this is a one-time impact, as it only reflects the construction process.

An impact analysis also provides information on wages and benefits. In Table 1, the labor income figure provides insight into the money that households will earn from the construction project. The direct effect of labor income supported by this facility's construction is approximately $9 million. Combining the direct, indirect and induced effects, total labor income is projected to be more than $17 million in the state economy. That is, more than $17 million of labor income will be created in Georgia because of this construction project.

The construction project is estimated to generate a total of 423 jobs in Georgia. Total employment represents full- and part-time jobs, and its impact can be broken down to show the indirect and induced employment changes. Indirectly, 100 jobs will be created as a result of business to business activity associated with the constructing the facility. And, an additional 113 jobs will be created in the state to support increased household spending by those workers affected directly and indirectly by the construction project. The economic activity will also have a significant impact on tax revenues as well. It is estimated that state and local non-education tax revenues would increase by more than $2 million.

Table 2 illustrates the total projected economic impact on all major sectors of Georgia's economy by construction of a large-scale, 533 WTPD biomass gasification facility. In other words, Table 2 shows to what magnitude – in terms of output, labor income and employment – major sectors of the state economy are impacted by the construction project.

Table 2:
533 WTPD Construction --- Projected Economic Benefits to all Major Sectors of Georgia's Economy
(all Georgia counties included)

	Output Impact	Labor Income Impact	Employment Impact
Agriculture	$102,898	$27,442	1
Mining	$5,667	$1,327	0
Construction	$3,137,477	$1,663,785	44
Manufacturing	**$35,895,668**	**$8,119,804**	**184**
TCPU	$2,607,390	$881,070	16
Trade	$5,305,217	$2,150,407	53
FIRE	$2,968,098	$751,816	18
Services	$6,016,344	$3,264,643	98
Government	$1,309,891	$83,025	2
Other	$1,265,224	$382,546	18
TOTAL	**$61,129,802**	**$17,325,865**	**423**

As evident in the emboldened "Manufacturing" row of Table 2, the manufacturing sector of Georgia's economy enjoys the highest level of economic benefits, or economic impact. This comes as no surprise because direct expenditures to manufacturers of the advanced and relatively complex power generation technology are quite significant. For example, the expenditure made to the manufacturer of the facility's power generation equipment constitutes roughly 35% of all capital costs. The total output impact to this sector is nearly $36 million, while the total impact of labor income and employment is more than $8 million and 184 jobs, respectively.

Direct expenditures made to the "Construction" sector of Georgia's economy are not nearly as significant, relative to those made to the state's manufacturing sector as discussed above. Actual construction – preparing the land and site and constructing buildings to house various functions of the business – only constitutes roughly 8% of capital costs. However, depending upon the location of this biomass gasification facility and the availability of resources such as construction firms and labor, it is likely that this economic impact will largely affect the economy of the local area. The total output impact on Georgia's construction sector is more than $3 million. Such a level of economic activity supports 44 full- and part-time jobs and nearly $2 million of labor income in the state construction sector.

III. OPERATIONS-RELATED ECONOMIC IMPACTS

The construction-related economic impact on Georgia's economy is only a one-time economic occurrence. In other words, once construction and equipment purchasing for a new venture ends, the economic impact ends shortly thereafter.

However, through its operations (e.g., selling its output and paying its employees), a new venture will generate continuous economic activity, creating continuous economic impacts on the collective economic landscape of the state.

Economic Impact of Operations on Georgia's Economy

Table 3 shows the economic impact of the facility's operations on Georgia's economy.

Table 3:
533 WTPD Operations --- Projected Economic Benefits to Georgia's Economy
(all Georgia counties included)

	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Output	$10,276,934	$4,228,839	$2,992,165	$17,497,939
Labor Income	$1,989,100	$1,767,309	$1,005,491	$4,761,900
Employment	25	41	29	95
Tax				$776,323

The direct effect associated with output, $10.3 million, is nothing more than the projected revenues (sales) of a single 533 WTPD biomass gasification facility. This direct output effect indirectly creates another $4 million in economic activity as the facility purchases products and services from other businesses to operate the plant. Also part of this indirect effect, supporting businesses purchase goods and services from other businesses throughout the state economy to operate their businesses. The result of increased household income from the creation of new jobs by the FOC and supporting businesses create an induced economic impact of nearly $3 million. The induced impact represents households spending income in Georgia on consumer goods, i.e., eating at restaurants and purchasing durable goods. Thus, the total economic impact on Georgia, in terms of output, the operation of the biomass gasification facility is estimated to be nearly $17.5 million annually.

The direct effect associated with labor income, approximately $2 million, is wages and benefits paid to the biomass gasification facility's employees. The indirect labor income effect is projected to be nearly $1.8 million. Again, this represents additional wages and benefits associated with the increase in indirect employment. Because of the additional labor income generated in Georgia by this facility and its supporting businesses, local area household spending would increase by more than $1 million.

The facility's employment impact is similar. This business will initially employ 25 people (direct effect). In this workforce total is 1 general manager, 2 accounting

personnel, 2 clerical support personnel, and 20 general laborers. The 25 jobs created by this facility have an indirect effect of 41 jobs in other businesses throughout Georgia, and the induced effect (jobs created from additional household spending) is 29 jobs. Summing the three effects reveals a total employment impact on Georgia's economy of 95 new jobs. With this new economic activity, tax revenues, state and local non-educational, would be increased by more than $750,000 annually.

Table 4 illustrates how major sectors of the state's economy are impacted by the biomass gasification facility's operations.

Table 4:
533 WTPD Operations --- Projected Benefits to all Major Sectors of Georgia's Economy
(all Georgia counties included)

	Output Impact	Labor Income Impact	Employment Impact
Agriculture	$33,037	$8,783	0
Mining	$3,113	$825	0
Construction	$533,753	$295,270	7
Manufacturing	$741,673	$163,327	4
TCPU	**$11,276,601**	**$2,340,741**	**33**
Trade	$930,380	$388,680	10
FIRE	$1,109,626	$270,185	6
Services	$2,196,097	$1,170,154	30
Government	$380,802	$30,719	1
Other	$292,857	$93,218	4
TOTAL	**$17,497,935**	**$4,761,900**	**95**

As shown above in Table 4, the emboldened "TCPU" sector, or transportation, communications, and public/private utilities sector, of Georgia's economy realizes the highest economic impact in all three analysis categories – output, labor income, and employment. This comes as no surprise since the biomass gasification facility itself would be a part of the state economy's TCPU sector.

IV. CONCLUSION

In summary, this economic impact analysis shows how the construction and operations of a new venture such as a large-scale (533 WTPD) biomass gasification facility might contribute to and impact Georgia's economy. However, the economic impacts of construction and operations should not be summed in order to reveal a "grand total" economic impact on Georgia's economy. As discussed above, economic impacts due to construction are a one-time economic occurrence, unlike those associated with the operations of a business which can be said to be continuous, or day-after-day, year-after-year, as long as the business continues to exist and sell its output.