Economic Impact of a Wind Generation Project in Somerset County Maryland

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The Jacob France Institute at the University of Baltimore

The Jacob France Institute is the sponsored research unit of the Merrick School of Business at the University of Baltimore. Created in 1990, and with a staff of 10, the Institute provides economic, economic development, and workforce development research and technical assistance to public and private clients including the Maryland Department of Business and Economic Development, the Economic Alliance of Greater Baltimore, the Greater Washington Initiative, as well as City and County economic development offices. The JFI has been involved in analyzing the economic impact of institutions, industries and projects for nearly two decades. The JFI specializes in analyzing the economic impacts associated with colleges and universities, hospitals, major public investments, tourism, and technology related development.

The Project Team

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Executive Summary

The Great Bay Wind Energy Center commissioned this study by the University of Baltimore, Jacob France Institute, on the economic impact of a wind energy installation proposed for Somerset County Maryland. The Great Bay Wind Energy Center as currently proposed, consists of the installation of 65 wind turbines with a plated generating capacity of 2300 kilowatts each or 149.5 megawatts in total.

The economic impact of this project occurs in two phases: the initial construction phase; and, after completion of the project, the operation and maintenance phase. This report evaluates the effects on employment, labor income, output and the fiscal effects at the County level and the State level. The complete report consists of four separate analyses, to assess the impact of both phases of the project within the two regions of analysis.

Introducing a new economic activity into a region has ripple effects that generate economic output greater than the value of the original investment as recipients of payments make purchases of additional goods and services setting off repeated rounds of economic activities. To analyze the impact of the project this study uses the MIG IMPLAN models for Somerset County and the State of Maryland. An important note is that the revenues generated by the sale of electricity once Great Bay Wind is in operation, are not included in the estimates from the IMPLAN model nor are the ripple effects arising as those revenues cycle through the economy. Therefore, the ultimate economic activity and tax impacts will be much larger than the models predict.

The major findings of this report are:

- Based on previous installations, the estimated installed costs of the project are expected to be $273.6 million dollars.
- The construction phase of the project is expected to require an expenditure of $50.2 million within Somerset County and within the County, it will generate 529 jobs, add $13.2 million to labor income and generate a total of $66.8 million in additional economic activity.
- At the State level, 766.4 Maryland jobs will be created in the construction phase, labor income will increase by $29.2 million and the total increase in State output will be $99.5 million.
- The ongoing operation and maintenance phase of the project will create 14.6 long term jobs in Somerset County and add $405,572 to labor income and increase economic activity by $1.8 million in the initial year of operations. Maintenance requirements will increase as the equipment ages, so these numbers are likely to increase as well.
- Within the State of Maryland, the ongoing operation and maintenance phase of the project will create 23.1 long term jobs, increase labor income by $1.4 million and increase economic activity by $4.6 million.
- The increases in employment and economic activity created during the construction phase are projected to add $3.6 million to state and local taxes of which $872,229 will be received by Somerset County.
- In the operation and maintenance stage, expenditures made by the Great Bay Wind Project will ultimately generate $3.4 million in additional taxes per year at the State and local government level and $2.9 million within Somerset County. Due to limitations of

the model, the complete economic impact and tax effects are likely to be understated since the multiplier effects of the taxes are not adequately captured.

- The Great Bay Wind Energy Center is projected to have annual revenues of $39 million. The economic activity and tax effects of those revenues are not reflected in the IMPLAN estimates.

Given that the Great Bay Wind Energy Project creates a large number of jobs, increases economic activity, and ultimately creates substantial new tax revenues within the economy, it is a highly desirable project in the current economic climate of government budget crises. As a renewable energy project it is also in line with the State of Maryland's energy plans which call for 20% of its energy to be generated by renewables by the year 2022.

Somerset County

Somerset County is the southernmost county in Maryland. The 2010 US Census indicated a population of 26,470. The Maryland Department of Business and Economic Development lists 2010 civilian employment in the County at only 6,683 workers, of which only 3,700 are employed in the private sector. Of those, 1,122 are employed within the trade, transportation and utilities sector[i]. Nonfarm employment in 2009 was 3,990 distributed across 385 firms. Median household income (2006 to 2010) was $42, 443 as compared to $70, 467 for the State of Maryland overall.

The percentage of persons living below the poverty level stood at 18.6 percent over the same period, at more than twice the state average of 8.6 percent. Preliminary Bureau of Labor Statistics (March 2012) show an unemployment rate of 10.8 percent which is slightly lower than

the March 2011 rate of 11.1 percent, but much higher than the state unemployment rate of 6.7, or the national rate of 8.4 percent[ii].

Although Maryland was cited as the wealthiest state in the nation in 2010 census data, this is not apparent in Somerset County. Combining the County's low income levels and high unemployment rate, deriving revenues from taxation to fund the County are especially problematic. Although the County has one of the highest income tax rates in the state, it comes as no surprise that the revenue yield is low, given the low incomes and high poverty rate in the County.

In the current fiscal environment, cuts in state and federal funding are taking a toll on Somerset County. One telling example arises with the recently announced Somerset County School budget. For the year 2013, school officials have proposed a budget that eliminates 19 positions and reduces programs[iii]. Going forward, further cuts in state and federal funding are anticipated and further burdens are expected to be transferred from state to local governments, most importantly the cost of teacher pensions, a portion of which is being shifted to already stressed county governments in Maryland.

As an overall impression, Somerset County is not only small in terms of revenue and population, but economically vulnerable as well. Reducing its exposure to the risk of state and federal budget cuts is of paramount importance. This view is supported by the Economic Development Commission and its drive to attract more jobs and business ventures. Although the statement that "we need jobs" is echoed across the country, in this county it has much greater justification than elsewhere. Adding business enterprises has a fiscal impact that extends beyond the salaries paid to the additional employees, not only in the form of tax revenues generated directly by the

employer but also in the form of business taxes and the additional taxes generated as the salaries and business income works through the economy. Clean energy is consistent with the State government's economic and alternative energy policy. And in the case of the wind generation project the ensuing property improvements create substantial property tax revenues as well.

With the aging of electricity generation facilities in Maryland and the potential for electricity generation shortfalls going forward, the prospects for cleanenergy generation projects are especially viable and particularly attractive for Somerset County.

Overview of the Great Bay Wind Project

The proposed site of this project covers an area of 10,000 acres and will have a generating capacity of 149.5 megawatts. This will require the installation of 65 wind turbines with a plated capacity of 2,300 kilowatts each. Based on previous installations, the estimated installed costs of the project are expected to be $273.6 million dollars.

Wind projects of this size can be expected to require a substantial amount of construction and installation work including site preparation, road construction, foundations, HV line extension and the construction of building infrastructure. The construction portion of the project is projected to require $68.6 million dollars. This level of investment will directly provide construction employment for a large number of workers during the installation and construction phase and subsequent employment for management and maintenance once in operation.

The most obvious economic benefits from the project arise from the direct employment of construction workers and purchases of materials and services in the construction phase. Once

completed, the project will provide jobs in the management, operation and maintenance of the plant and a source of income for the landowners who receive payments for land use. However, because of the multiplier effect, the benefits do not end there. As the money received by workers and businesses works its way through the economy, being in turn spent on other purchases of goods and services, the original expenditures create an impact that is amplified through the multiplier effect. In the sections that follow, these components of the economic impact within Maryland and specifically within Somerset County are estimated and analyzed.

Methodology

In order to estimate the economic impact of the wind turbine project on Somerset County and on Maryland as a whole, this report employs the IMPLAN software and data from Minnesota IMPLAN Group (MIG)[iv]. Because there are two phases of this project analyzed separately for Somerset County and Maryland—the construction phase and the operations and maintenance phase—4 separate analyses were conducted.

This study uses the standard regional economics modeling method of input/output analysis to quantify the direct and indirect (multiplier) impacts of the construction, operation and maintenance of the wind energy project. It employs IMPLAN Maryland and IMPLAN Somerset County economic input/output (I/O) models that quantify the interrelationships between economic sectors. I/O data show the flow of commodities to industries from producers and institutional consumers for any given state, region or county. The data also show consumption activities by workers, owners of capital, and imports from outside the state or region. These trade

flows built into the model permit estimating the impacts of one sector on all other sectors with which it interacts. In other words, I/O analysis models the flow of funds that originate from the direct expenditures associated with the construction and operation of the wind project and the ongoing ripple (multiplier) effects of these expenditures. An important note is that it captures the effects of the "first round" direct expenditures only. Once in operation, the Great Bay project will generate millions of dollars of revenues from the production of electricity which will enter the economy as well. This productive activity is not represented in the model, nor are the tax effects of that revenue included. This means that the impacts estimated by the model underestimate the gains by an amount that is larger than the revenues of Great Bay Wind[v].

I/O analysis represents the "gold standard" for measurement of economic impacts and is the generally accepted methodology for measuring the economic impact associated with projects, companies or of entire industries.

The IMPLAN model can be explained in the following simple terms. When payments are received by business enterprises, each of these in turn makes additional expenditures that follow a predictable pattern that can be estimated based on past spending patterns of the economic sector in which they operate. As an example, if a car dealership receives payment for a vehicle, the dealership spends some portion of the money on goods and services that result in a new round of additional expenditures and additional employment. This sequence of receiving and then spending the payments received repeats many times such that each dollar of the original payment results in more than one dollar of economic activity. For each sector of the economy there is a corresponding set of multipliers which can be used to estimate the overall impact on the economy under analysis. The multipliers vary not only by type of business, but also through

regional differences in spending and employment patterns. IMPLAN divides the economy into sectors based on NAIC codes to create the multipliers for each region.

The primary measures of economic activity contained in this report are: employment, employee compensation and output.

For each of these measures, there are three types of impacts:

- Direct Impacts are the effects of the initial expenditures that are paid to sectors within the region under study. For example, the payments received by a Somerset County based construction firm for building a foundation.
- Indirect Impacts are the result of expenditures made within the region by the firms associated with activities under analysis. For example, purchases of materials within Somerset County by a construction firm would be an indirect impact when analyzing Somerset County.
- Induced Impacts can be understood as the result of subsequent rounds of receipts and expenditures within the region. In this case, the Somerset County concrete plant will in turn make payments to Somerset County employees who will spend some fraction of their earnings on additional goods and services within Somerset County.

The Total Impact is the end result of the three types of impacts described above taken together.

In order to use the IMPLAN model to estimate these impacts, it is necessary to input estimates of the *in region* expenditures going to each economic sector. In the case at hand no contracts been awarded at this point, so projecting the expenditures by sector is not straightforward. To simplify that aspect of the process, the inputs needed for the IMPLAN model were estimated using the

Job and Economic Development Impacts (JEDI)[vi] software designed specifically for wind energy projects as well as the judgment of the consultant and development team.

JEDI projects the expenditures for each portion of the project based on the typical expenditures experienced in previous wind projects following a national model[vii]. These expenditures were subsequently adjusted in cases where better estimates of the *in region of analysis* costs could be obtained. From this initial stage, Maryland and Somerset County expenditure estimates, by sector were obtained for the construction phase and the operation and maintenance phase.

Data and Modeling Limitations

In order to estimate the economic impact within each of the two regions of analysis (Somerset County and the State of Maryland) it is necessary to estimate the fraction of each expenditure that will be spent within each study region, for each economic sector. Given the small scale of the economy of Somerset County, some affected sectors may be affected to a greater or lesser extent than the model predicts. It is also the case that the multipliers for Somerset County can significantly differ from the corresponding state multipliers. Due to the significantly lower earnings levels in the county in comparison to the state overall, employment impact estimates can appear inconsistent between the Maryland and County analyses[viii]. There may also be some small sample bias within the multipliers for the County as well. To the extent that this bias exists, it is more probable that this bias will cause an understatement in the activity generated since some sectors that have activity in the county may not be properly represented within the multiplier data.

Inputs for the IMPLAN Model

As outlined above, the starting point to construct the inputs needed for the IMPLAN models is the JEDI model which requires minimal inputs. Necessary JEDI inputs include the capacity of the plant in megawatts and the installed project cost per kilowatt in order to estimate detailed construction and operating and maintenance cost components. Great Bay Wind plans to install 65 turbines with a total capacity of 149.5 megawatts at a projected cost of $1,830 per kilowatt. Each of the line items obtained from this first stage, were then analyzed to determine the portion of that entry that was likely to be obtained within the State, within Somerset County, or from beyond the State boundaries.

The largest portion ($205.1 million) of the expenditures arises in the purchase and transportation to the site of the equipment. None of the equipment purchases are expected to have a state or local component but 25 percent of the transportation portion was estimated to occur within Maryland.

The remaining portions of the expenditures with a state or local component were allocated as shown in Table 1. For the labor component, it was assumed that the labor force would be resident in Somerset County during the construction phase. This may slightly overstate the economic benefits attributable to the County, but alternative assumptions would be arbitrary and likely to introduce greater distortion in the model.

Table 1: State and Local Components of Expenditures

Construction Phase	Expenditure ($ millions)	State	County
Equipment/Transportation	$21.9	25%	0
Materials	$43.0	81%	73%
Labor	$18.0	100%	100%
Development / Other Costs	$7.6	76%	11%
Operating and Maintenance Phase			
Labor	$0.65	100%	100%
Materials and Services	$5.7	58%	28%

For the construction phase, the materials portion includes concrete, rebar and other construction materials as well as the electrical components and cabling required to prepare the site and to connect the turbines. The labor component includes the site work, foundations, electrical, erection and other associated labor needed to construct the plant. Development and other costs include legal fees, engineering, site certificates and other miscellaneous expenditures.

Labor and materials for the operating phase include the normal expenditures on operation of the plant, maintenance and management of the plant.

The line items summarized in Table 1 were analyzed on an individual basis for local and state allocations and allocated as dollar amounts to the relevant economic sector by IMPLAN codes that are based on the NAIC codes. These amounts were the inputs to the IMPLAN models for Somerset County and the State.

Construction Phase Impacts in Somerset County

Including equipment costs, the complete construction is projected to cost $273.6 million of which more than $50.2 million will be construction expenditures within Somerset County. As shown in Table 2, the impact on the County in dollar terms is much larger than the $50 million expenditure, generating an additional $11 million in indirect output and $5.7 million in induced output through the multiplier effect. The total output generated is projected to exceed $66.8 million.

The impact on employment is similar, with a direct impact of 396 jobs. An additional 80 jobs are predicted through indirect effects and 53 jobs induced via the multiplier effect. In all, the job impact in Somerset County is 529. In view of the current nonfarm employment base of less than 4,000 jobs this represents a large impact on employment in the County even though some of the jobs will be filled from outside the County and many of the jobs are not permanent.

The total impact on labor income is $13.2 million. Again, in light of the size of the economy of Somerset County, the construction portion of the Great Bay project will contribute a substantial improvement to the current economic outlook.

Table 2: Construction Phase Impacts Summary (Somerset County)

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment (#Jobs)	396	80	53	529
Labor Income	$8,576,035	$3,116,378	$1,475,481	$13,167,894
Output	$50,164,531	$10,980,215	$5,681,005	$66,825,751

Source: IMPLAN

Table 3: Construction Phase Largest Sectoral Employment Effects (Somerset County)

Description	Employment	Labor Income	Output
Construction of other new nonresidential structures	396.2	$8,576,035	$50,164,531
Architectural, engineering, and related services	15.6	$805,471	$1,595,833
Food services and drinking places	8.8	$108,007	$446,429
Wholesale trade businesses	8.0	$631,432	$1,390,058
Real estate establishments	6.7	$75,508	$1,091,446
Offices of physicians, dentists, and other health practitioners	6.3	$247,942	$545,958
Automotive repair and maintenance, except car washes	6.2	$287,168	$572,723
Commercial and industrial machinery and equipment repair and maintenance	4.5	$248,926	$408,275
Transport by truck	4.2	$252,995	$537,358
Retail Stores - Food and beverage	4.0	$75,229	$193,821

Source: IMPLAN

Table 3 provides information on the distribution of the employment gains across economic sectors. The ten sectors experiencing the largest impact are shown in a disaggregated form. The

largest employment impact is within the construction sector as expected with 396 jobs accompanied by a $50.2 million increase in output. At this level of decomposition, other sectors experience job increases on the order of less than 16. The architectural, engineering and related services sector shows the second largest impact with 15.6 jobs and an increase in economic activity of $1.6 million. In the construction phase, other sectors benefit from the economic activity created as the construction firms and workers employed as a result of the construction activity make purchases in the County. An obvious beneficiary is the food services and drinking establishment sector which is predicted to experience an 8.8 increase in jobs and a $446,429 increase in output.

The wholesale trade sector is projected to gain 8 jobs and $1.4 million in output. Although not shown in the table, once aggregated to the 2 digit code level the retail sector as an example, is expected to show an increase of 17.3 jobs and a $2.3 million increase in output. Each of these contributions to the economy is highly significant in comparison to the overall size of the Somerset County economy.

Table 4 presents the top sectors ranked by output. Again, the largest amount of economic activity gain appears in the construction sector. The installation of the equipment, electrical work and other construction activities generates a large portion of the $1.4 million increase in the wholesale trade sector. Similarly, the erection of the towers, site preparation and other construction activities generates much of the increase in the commercial and industrial machinery and equipment leasing segment. The architectural, engineering and related services sector is projected to receive a $1.6 million boost in economic activity and a job gain of 15.6. These are high quality jobs with salaries that are well above the median income in Somerset County.

Table 4: Construction Phase Largest Sectoral Output Impacts (Somerset County)

Description	Employment	Labor Income	Output
Construction of other new nonresidential structures	396.2	$8,576,035	$50,164,531
Petroleum refineries	0.3	$25,731	$2,255,785
Architectural, engineering, and related services	15.6	$805,471	$1,595,833
Wholesale trade businesses	8.0	$631,432	$1,390,058
Real estate establishments	6.7	$75,508	$1,091,446
Imputed rental activity for owner-occupied dwellings	0.0	$0	$1,072,519
Commercial and industrial machinery and equipment rental and leasing	3.9	$185,834	$981,475
Monetary authorities and depository credit intermediation activities	1.8	$69,497	$602,361
Automotive repair and maintenance, except car washes	6.2	$287,168	$572,723
Offices of physicians, dentists, and other health practitioners	6.3	$247,942	$545,958
Transport by truck	4.2	$252,295	$537,358

Source: IMPLAN

The imputed rental activity for owner-occupied dwellings sector, warrants some explanation. In order to capture the effects of the in county expenditures made by construction workers, it was assumed that they will be residing in the County. Assuming otherwise would grossly understate the benefits to the County. However, this causes an anticipated effect in the IMPLAN model in that hotels and other short term housing expenditures are understated. This effect is captured in the imputed rental income from owner occupied housing as a result. In reality, a large portion of the $153,694 attributed to the imputed rental activity sector is likely to appear in the hotel and other temporary housing sector with additional ripple effects on output and employment in other sectors such as retail stores and restaurants.

It is worth emphasizing the significance of the contributions of the construction phase of the Great Bay Wind project. An additional 529 jobs and a $66.8 million increase in economic activity is a major contribution to the economy of the County.

Operations and Maintenance Phase Impacts in Somerset County

Once the construction phase is completed, Great Bay Wind will continue to contribute to the economy of the County through the operations and maintenance of the facility. What may not be apparent when viewing a wind farm from the highway is that the operation does not function on its own. Wind turbines require routine maintenance and as with any other production process, there is an ongoing need for property maintenance and management of the operation.

Although it is not captured within the model, maintenance requirements are expected to grow over time with major maintenance expenditures of $1.2 million dollars per year projected beyond year 10[ix]. Over time, turbine components, especially drive train components such as gears and bearings are subject to wear and need replacement. This maintenance requires additional labor inputs and parts purchases that are not part of this model. Obvious local beneficiaries of these future expenditures are the wholesale sector and local machine shops. Each of these local expenditures can be expected to contribute additional economic activity beyond the direct expenditures through the ripple effects of additional rounds of receipts and expenditures when those repairs are made.

Table 5: Operation and Maintenance Phase Impacts Summary (Somerset County)

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment (#Jobs)	6	0.8	7.8	14.6
Labor Income	$162,237	$20,797	$222,538	$405,572
Output	$811,236	$104,688	$856,462	$1,772,387

Source: IMPLAN

Table 5 lists the impacts on employment and output predicted by the IMPLAN model. The model predicts an initial direct impact of 6 jobs and a total effect of 14.6 jobs through the multiplier effects. The anticipated impact is an increase of $1.8 million in output within Somerset County. The breakdown of the effects is shown in Table 5. Of the increase in output, $405,572 is predicted as the total increase in labor income. Additional jobs and additional economic activity is unquestionably important to the County's economy.

Payments to land owners will infuse almost $1.4 million per year into the local economy, which indicates the overall impact may be larger than predicted by the model depending on how much of the payments land owners in turn, spend in the County. For the purposes of this model, the payments to land owners were treated as an increase in income to households with incomes in the $50k to $75k bracket.

There is one other effect within the model that will be discussed more adequately in the discussion of the fiscal aspects of the project but it warrants mention here. The assessed value of the plant and equipment is anticipated to reach $294 million. After a fifty percent abatement, the

taxable value is $147 million which at the County tax rate of 2.20923 percent, yields property taxes of $3.2 million in the first year alone. Because of depreciation, this tax amount declines over the 30 year amortization schedule. However, it is a cash flow effect occurring during the operation and maintenance phase of the project that is relevant in considering the overall impact of the Great Bay project on Somerset County.

Tables 6 and 7 provide information on the top ten sectors impacted by the operations and maintenance phase within the County, ranked by employment and output respectively. There is almost complete overlap between the two tables although the rankings of the sectors differ due to the differences in labor components of production across the sectors.

The largest employment impacts occur in the services sectors that are directly related to the operation and management of the facility. Taking the employment effects in the services to buildings and dwellings, business support services, and management of companies and enterprises sectors together, there is an employment increase of 6.1 which is largely the result of the operation and management effects of the wind turbines. In a more aggregated form, the retail sector is predicted to gain 1.6 employees and the medical care sector will gain 1.8 employees from the impact of Great Bay Wind on the local economy.

Table 6: Operations and Maintenance Phase Largest Sectoral Employment Impacts

Description	Employment	Labor Income	Output
Services to buildings and dwellings	2.7	$30,024	$131,003
Business support services	1.5	$20,628	$52,271
Food services and drinking places	1.0	$12,875	$53,215
Offices of physicians, dentists, and other health practitioners	0.9	$37,326	$82,191
Management of companies and enterprises	0.9	$46,152	$128,085
Real estate establishments	0.6	$6,940	$100,320
Electric power generation, transmission, and distribution	0.6	$56,532	$481,454
Nursing and residential care facilities	0.4	$14,858	$26,699
Retail Stores - Building material and garden supply	0.4	$10,477	$30,591
Wholesale trade businesses	0.4	$28,456	$62,644

Source: IMPLAN

Table 7: Operations and Maintenance Phase Largest Sectoral Output Effects

Description	Employment	Labor Income	Output
Electric power generation, transmission, and distribution	0.6	$56,532	$481,454
Imputed rental activity for owner-occupied dwellings	0.0	$0	$153,694
Services to buildings and dwellings	2.7	$30,024	$131,003
Management of companies and enterprises	0.9	$46,152	$128,085
Real estate establishments	0.6	$6,940	$100,320
Offices of physicians, dentists, and other health practitioners	0.9	$37,326	$82,191
Wholesale trade businesses	0.4	$28,456	$62,644
Petroleum refineries	0.0	$667	$58,505
Food services and drinking places	1.0	$12,875	$53,215
Business support services	1.5	$20,628	$52,271

Source: IMPLAN

Viewed from the perspective of output, the greatest impact occurs in the electric power generation, transmission and distribution sector. The total increase in output is $481,454. The imputed rental activity of $152,694 can be interpreted as additional home ownership. Unlike the construction phase, employment resulting from the ongoing operations of Great Bay Wind are permanent, not temporary. Therefore it is reasonable to accept the additional home ownership related output at face value. Aggregating the retail sector, as whole, there is an increase in economic activity of $92,921 dollars in the first operating year. Similarly, aggregating payments to the offices of physicians and dentists, with hospital and other related medical services the total economic activity gain is $163,352.

The addition of $1.8 million dollars in economic activity and an additional 14.6 permanent jobs is a strong argument in support of the Great Bay Wind project. Once more, these are large numbers when compared to the economic scale of Somerset County.

Construction Phase Impacts in the State of Maryland

Maryland's State Government has made clear its support for the development of clean energy projects in the interest of spurring generating capacity and addressing air quality and other environmental issues. Under the current economic climate, there is also a strong incentive to support projects that generate employment, additional output and consequently tax revenues, within the State. The construction and operational phases of Great Bay Wind are in keeping with these policy priorities.

As with the Somerset County analyses, the largest effects on employment and economic activity in the State are seen during the construction phase. The State level effects clearly include the effects within Somerset County, but there are larger effects in the State level analyses. The differences arise because there are additional products and services not currently available in Somerset County, which can be provided by sources within the State. The most notable examples are cabling and other materials, and legal and engineering services, which are more likely to be provided within the State, but not within the County.

As a consequence of the additional goods and services available at the State level, the projected total impact on the State created by the construction phase of the project is noticeably larger. A summary of the effects is shown in Table 8. The IMPLAN model predicts a total employment impact of 766.4 jobs. The total effects on labor income and economic activity are $29.2 million and $99.5 million, respectively[x].

Table 8: Construction Phase Impacts (Maryland)

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment (# Jobs)	483	131	152.4	766.4
Labor Income	$14,357,535	$7,975,409	$6,821,644	$29,154,588
Output	$61,245,383	$18,889,744	$19,373,698	$99,508,825

Source: IMPLAN

Table 9: Construction Phase Largest Sectoral Employment Impacts (Maryland)

Description	Employment	Labor Income	Output
Construction of other new nonresidential structures	396.0	$8,576,034	$50,164,531
Architectural, engineering, and related services	50.5	$4,129,730	$6,739,763
Transport by truck	50.2	$2,707,710	$6,087,703
Food services and drinking places	19.7	$426,404	$1,187,017
Legal services	14.4	$1,132,153	$2,213,902
Real estate establishments	12.9	$261,023	$2,216,144
Wholesale trade businesses	11.8	$996,025	$2,116,201
Employment services	11.2	$417,573	$548,429
Offices of physicians, dentists, and other health practitioners	9.0	$692,745	$1,131,603
Private hospitals	8.5	$570,822	$1,143,431

Source: IMPLAN

The relationship between the direct impact on labor income and the total effect on labor income demonstrates the importance of the multiplier effect. As the original expenditures make their way through the economy, the total impact of $29.2 million is more than double the direct impact of $14.4 million. A similar comparison can be made between the $61.2 million dollar direct effect on output, and the total effect of $99.5 million total increase in output. The clear point to be taken is that this project creates jobs and pumps far more money into the economy than just the direct effects generated by constructing the wind turbines and supporting infrastructure.

The ten sectors with the largest gains in employment are listed in Table 9. More than half of the employment gains occur within the construction sector[xi]. The model also predicts gains of 50.5 jobs in the architectural, engineering, and related services sector. In order to transport the equipment and materials to the site, there is a large employment gain of 50.2 created in the

transportation by truck sector. The food services and drinking places sector and the legal services sector show gains of 19.7 and 14.4 jobs, respectively.

At a more aggregated level, the combined retail sector is projected to experience an increase of 43.3 jobs within the State as a result of the Great Bay project. Health care practitioners, hospitals and related sectors gain 39 additional jobs.

Table 10 contains the top ten sectors in terms of gains in total output. The construction sector experiences more than 50 percent of the total output gain. The transport by truck sector and architectural, engineering and related services see gains of $6.7 million and $6.1 million. As included in prior sections, an aggregate of the retail sector yields an increase in output of $3 million and the medical practitioners, dentists and other health related services gain $4.9 million.

In overall terms, the IMPLAN model analyses strongly indicates that the construction of the Great Bay Wind project will have a large impact on the economy of both Somerset County and the State as whole in terms of employment, employee income and increased output.

Table 10: Construction Phase Largest Sectoral Output Impacts (Maryland)

Description	Employment	Labor Income	Output
Construction of other new nonresidential structures	396.0	$8,576,034	$50,164,531
Architectural, engineering, and related services	50.5	$4,129,730	$6,739,763
Transport by truck	50.2	$2,707,710	$6,087,703
Imputed rental activity for owner-occupied dwellings	0.0	$0	$2,548,043
Real estate establishments	12.9	$261,023	$2,216,144
Legal services	14.4	$1,132,153	$2,213,902
Wholesale trade businesses	11.8	$996,025	$2,116,201
Telecommunications	2.8	$218,033	$1,278,974
Monetary authorities and depository credit intermediation activities	3.6	$200,225	$1,249,425
Food services and drinking places	19.7	$426,404	$1,187,017

Source: IMPLAN

Operations and Maintenance Phase Impacts in the State of Maryland

The total impact on employment predicted for Maryland from the operation of Great Bay Wind is 23.1 jobs. This is 58 percent greater than the projections for Somerset County alone. Table 11 summarizes the key projections, showing a total increase in output of $4.6 million and $1.4 million in labor income. The total increase in economic activity is more than 2.5 times the increase projected for Somerset County alone. Evidently, what's good for Somerset County is very good for the State.

Table 11: Operations and Maintenance Impacts (Maryland)

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
Employment (#Jobs)	5.6	1.8	15.7	23.1
Labor Income	$638,721	$93,186	$711,466	$1,443,372
Output	$2,324,976	$255,034	$2,021,875	$4,601,885

Source: IMPLAN

The individual entries in Table 12, showing the top ten sectors by employment will not be directly comparable to the analysis for the County due to differences in the underlying multipliers. This is not unexpected in the IMPLAN models. Nonetheless, many of the same sectors appear among the top ten affected sectors. The electric power generation and distribution sector shows an increase of 2.1 jobs. The food services and drinking places sector is projected to gain 1.8 jobs. Again, these job gains are long term.

Table 12: Operations and Maintenance Phase Largest Sectoral Employment Impacts (Maryland)

Description	Employment	Labor Income	Output
Electric power generation, transmission, and distribution	2.1	$458,892	$1,987,244
Food services and drinking places	1.8	$39,397	$109,672
Other support services	1.1	$43,293	$117,765
Real estate establishments	1.0	$20,980	$178,124
Business support services	1.0	$33,505	$55,404
Private hospitals	1.0	$65,281	$130,765
Offices of physicians, dentists, and other health practitioners	1.0	$73,158	$119,504
Retail Stores - Building material and garden supply	0.8	$33,392	$67,887
Management of companies and enterprises	0.7	$75,791	$139,852
Nursing and residential care facilities	0.6	$22,109	$38,392

Source: IMPLAN

Table 13: Operations and Maintenance Phase Largest Sectoral Output Impacts (Maryland)

Description	Employment	Labor Income	Output
Electric power generation, transmission, and distribution	2.1	$458,892	$1,987,244
Imputed rental activity for owner-occupied dwellings	0.0	$0	$251,174
Real estate establishments	1.0	$20,980	$178,124
Management of companies and enterprises	0.7	$75,791	$139,852
Private hospitals	1.0	$65,281	$130,765
Offices of physicians, dentists, and other health practitioners	1.0	$73,158	$119,504
Other support services	1.1	$43,293	$117,765
Food services and drinking places	1.8	$39,397	$109,672
Wholesale trade businesses	0.5	$42,440	$90,170
Monetary authorities and depository credit intermediation activities	0.2	$12,680	$79,125

Source: IMPLAN

Results in relation to the top ten output effects appear in Table 13. Not surprisingly, the electric power generation, transmission, and distribution sector, also experiences the largest increase in terms of output, with a projected $2 million gain. Aggregating as in the previous sections, the retail sector gain is $235,581 and the health services sector experiences a gain of $334,282 in output. These are expectedly larger than the County results.

As with the Somerset County analysis, this does not reflect the increase in maintenance that will take place as the equipment wears, so the overall increase in jobs and output is not fully reflected in these projections. For that reason, the gains to the State in terms of output will be greater than projected within this analysis.

Fiscal Impacts

The Great Bay Wind project is a large investment in Somerset County and will contribute more than $2.9 million to the County's tax revenues and $3.3 million in combined local and State taxes during its initial year of operation. During the construction phase, it will contribute an estimated $872,229 to Somerset County taxes and a combined contribution of $3.6 million in local and State taxes. Due to modeling limitations, this is a very conservative estimate and the overall tax effects are expected to be much larger. To give some perspective, the $2.9 million Somerset County tax contribution is 9.2 percent of the Somerset County Board of Education's proposed fiscal year 2013 budget.

The IMPLAN models in this report do not fully reflect the multiplier effects of the taxes collected. Since taxes are in fact spent to purchase goods and services, the multiplier effect is larger than the effect indicated by these models. This occurs because each of the activities that occur as an expenditure is received and in turn spent again, to generate additional rounds of economic output and taxes, which are paid to local, state and federal tax agencies. Tables 14 and 15 provide summaries of the tax impacts on the budgets of Somerset County and on the State and County collectively.

The IMPLAN model does not provide a separate summary of local taxes, so the entries in Table 14 were for the most part calculated from the IMPLAN tax summary output. The exception is the business property tax portion. What IMPLAN captures is the typical expenditures—including additional taxes paid—of the sectors that experience gains in activity. What it does not properly capture as modeled, is the additional taxes paid by the new industry under study. Great Bay's

investment is subject to taxation by the County in the form of taxes on the assessed value of property improvements.

The property tax impact of Great Bay Wind is substantial. Although the actual amount may vary depending on the assessed value, an estimate of the taxes was computed based on the projected $273.6 million dollar installed cost. Given an assessed value equal to this estimate of the installed cost, the taxable amount after a 50 percent abatement is $136.8 million dollars in the first year of operation. In Somerset County, the property tax rate is 2.20925 percent of the assessed value. From this, the property taxes directly attributable to Great Bay Wind will be $2.9 million[xii] in the initial operating year.

The property improvements will be depreciated over a 30 year period, so the property tax will decrease over time. Nonetheless, the total of the property taxes over the 30 year period is projected as $44.4 million on an undiscounted basis and taxes are projected to remain at or above $2 million for the first 10 years and at or above the $1 million mark for the first 20 years of operations. This amount is in addition to the tax revenues generated as a consequence of the additional employment, purchases by Great Bay Wind and its employees, and subsequent purchases in the region by the recipients of related payments and purchases.

A second analysis was conducted based on an assessment of $1.47 million per megawatt installed. The justification is that this rate has been applied to other wind power projects in the State. This results in a lower taxable base of $109.9 million after the 50 percent abatement. With this lower base, the first year of property taxes would be $2.3 million. The tax remains above the $1 million level until year 17. Even at this lower assessed value, the project still contributes a major tax benefit to the County.

It is noteworthy that the current budget for Somerset County reflects a $1.25 million decrease in property taxes as a result of lower property assessments[xiii]. This single project has the capacity to more than fully offset that property tax decrease for more than 15 years, even at the lowest assessed property value that was analyzed. Again, this ignores the other tax benefits that are generated as a result of the operational activities of Great Bay Wind.

Other notable comparisons exist within the Somerset County Budget for fiscal year 2011-2012:

- Tax revenues from Personal Property, Railroad and Public Utilities and Corporations total $1.6 million.
- Total taxes from Real Property after abatements and the Homestead Tax Credit total $15.5 million.
- All County Real Estate and Income Tax revenues total $21.8 million.

A $2.3 million addition in property taxes represents 10.5 percent of the Real Estate and Income Tax revenues in the current budget.

Although there is no Somerset County tax on the taxable income of Great Bay Wind, there are tax consequences to the earnings generated by its operations. Over much of the life of the project, these taxes are in the range of $7 million to $8 million per year[xiv].

In closing, it must be emphasized that the impacts obtained from the IMPLAN model are an understatement of the gains that will arise. As explained above, the electricity sales revenues and taxes paid by Great Bay Wind are substantial and not reflected in the impacts estimated by the IMPLAN models. Taking the employment gains, increases to employee income and additional economic output, the Great Bay Project is very beneficial to Somerset County and State of Maryland as a whole.

Table 14: Tax Impacts (Somerset County)

Description	Phase 1: Construction	Phase 2: Operations and Maintenance
Indirect Business Taxes	$680,244	$2,940,859
Personal Taxes	$191,984	$5,775
Total Local Taxes	$872,229	$2,946,633

Source: IMPLAN and author estimates.

Table 15: State of Maryland and Local Tax Impacts

Combined State and Local Taxes	Construction	Operation and Maintenance
Dividend Taxes	$7,149	$758
Social Insurance Contributions	$32,334	$1,672
Indirect Business Taxes	$2,218,597	$3,294,432
Corporate Profits Tax	$121,341	$12,857
Personal Taxes	$1,238,085	$61,131
Total State and Local Tax	$3,617,506	$3,370,850

Source: IMPLAN and author estimates.

[i] Brief Economic Facts: Somerset County, Maryland, Somerset County Economic Development Commission. http://www.somersetcountyedc.org/files/page_content_pdf/2012-brief-economic-summary.pdf

[ii] United States Department of Labor, Bureau of Labor Statistics http://www.bls.gov/ro3/mdlaus.htm

[iii] "Somerset BOE Budget Cuts: 19 positions could be eliminated", Reported in DelmarvaNow, May 4, 2012. http://www.delmarvanow.com/article/20120504/SH01/205040307/Somerset-BOE-budget-cuts-jobs

[iv] Miinesota IMPLAN Group http://implan.com/v4/index.php/V4/index.php?option=com_content&view=article&id=282:what-is-implan&catid=152:implan-appliance-&Itemid=2

[v] The underestimation is larger than Great Bay's revenues because of the multiplier effect generated when those revenues are spent and repeatedly cycle through the economy.

[vi] Jobs and Economic Development Impacts (JEDI) http://www.nrel.gov/analysis/jedi/

[vii] The analysis employs the JEDI convention of tracking only local spending on construction and operations and maintenance as the direct effect. The JEDI estimates are derived from national expenditure patterns.

[viii] In these cases, we adjusted the state model to include all direct employment in Somerset County.

[ix] Projections provided by Great Bay Wind.

[x] Note that the multipliers underlying the State analyses are not the same as the multipliers for Somerset County.

[xi] Since wage rates are lower in Somerset County, the IMPLAN model predicts higher employment rates per dollar spent using the Somerset County data than are predicted within the Maryland data set. For that reason, the Maryland model was adjusted to include the same number of construction workers and the same initial payments to the construction sector as the Somerset County model to preserve consistency.

[xii] Projections by Great Bay Wind based on an installed cost of $294 million would create a property tax liability of $3.2 million in the first year.

[xiii] Presentation of the Somerset County Budget for 2013. At this budget meeting, it was also disclosed that there will be a $480,000 allowance for teacher retirements which will for the first time, have to be covered by the County.

[xiv] Tax loss carry forwards are projected to eliminate tax liability for the first 5 years of operations. Source: Great Bay Wind pro formas.