

# Economic and Fiscal Impact of the Angelina Solar Facility

November, 2018

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## Executive Summary

The construction of the Angelina Solar Facility (the “Facility”) in Preble County, Ohio will increase economic activity between \$50.2 and \$161.8 million within the State of Ohio.<sup>1</sup> The spending necessary to construct the Facility will support between 518 and 1,076 full- and/or part-time jobs within Ohio, with average annual wages of approximately \$49,000 to \$51,700 depending on the construction scenario. Table ES-1 details employment by economic sector during the Facility’s construction phase and is segmented by material procurement scenario.<sup>2</sup> During the construction phase of the Facility, 290 jobs will be directly engaged at the proposed project site in the Construction/Installations Industry.

**Table ES-1: Construction Phase Employment by Economic Sector**

| Industry                               | Preble County |           |            | Ohio Base-Case |            |            | Ohio High Content |            |              |
|--|---------------|-----------|------------|----------------|------------|------------|-------------------|------------|--------------|
|  | Direct        | Indirect  | Total      | Direct         | Indirect   | Total      | Direct            | Indirect   | Total        |
| Construction/Installations             | 290           | 37        | 327        | 290            | 144        | 434        | 290               | 144        | 434          |
| Fabricated Metals                      | 0             | 0         | 0          | 0              | 0          | 0          | 35                | 73         | 108          |
| Energy Wire Manufacturing              | 0             | 0         | 0          | 8              | 19         | 27         | 8                 | 19         | 27           |
| Wholesale Trade                        | 1             | 0         | 1          | 3              | 5          | 8          | 35                | 55         | 90           |
| Retail Trade                           | 0             | 0         | 0          | 0              | 0          | 0          | 16                | 10         | 26           |
| Transportation and Utilities           | 0             | 0         | 0          | 0              | 0          | 0          | 2                 | 5          | 7            |
| Office Services                        | 9             | 2         | 11         | 12             | 12         | 24         | 13                | 12         | 25           |
| Architectural and Engineering Services | 1             | 0         | 1          | 1              | 1          | 2          | 1                 | 1          | 2            |
| Other services                         | 10            | 2         | 12         | 13             | 9          | 22         | 13                | 9          | 22           |
| Government                             | 0             | 0         | 0          | 0              | 0          | 0          | 0                 | 0          | 0            |
| Semiconductor Manufacturing            | 0             | 0         | 0          | 0              | 0          | 0          | 106               | 229        | 335          |
| <b>Total</b>                           | <b>311</b>    | <b>41</b> | <b>352</b> | <b>327</b>     | <b>191</b> | <b>518</b> | <b>519</b>        | <b>557</b> | <b>1,076</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns.

Once construction is complete, the ongoing operations of the Facility will continue to benefit Preble County and the State of Ohio, primarily through the wages paid to workers at the Facility and equipment purchases for maintenance over the up-to 40-year life of the Angelina Solar Facility. The State is estimated to realize an additional \$1.5 to \$2.3 million in increased economic activity during the operations phase, of which approximately \$790,000 will benefit Preble County. Employment within the State will increase by approximately 19 jobs, of which 13 will be in Preble County.

During the construction and operation phases of the Facility, local municipal, county, and state governments will benefit from increased tax revenues. The construction phase of the

<sup>1</sup> All monetary figures throughout this report are in 2017 dollars.

<sup>2</sup> State and county-level results of the analysis are displayed separately to enable easy identification of relevant impacts for both entities. These scenarios are mutually exclusive and are not intended to complement one another.

Facility is estimated to generate up to approximately \$2.9 million in total tax revenues, while the operations phase is estimated to increase revenues by up to an estimated \$53,000 annually. Preble County will receive approximately \$719,200 annually in payments made in lieu of property taxes for the duration of a Facility's operation. While the Facility is expected to positively affect the local economy, the University of Cincinnati Economics Center (Economics Center) found no adverse employment, transportation, or housing impacts from its analysis of the Facility. Additionally, landowner families participating in the Facility are expected to receive \$[REDACTED] per year in lease payments.

The Economics Center analyzed two scenarios for materials used in the construction and operation of the solar facility: in-state and out-of-state procurement of solar panels and racking. The majority of electrical and civil construction equipment are expected to be purchased within Ohio; however, no utility-scale solar inverters are produced in Ohio. The scenario in which the solar panels and mounting are purchased and manufactured within Ohio is referred to as the High Ohio Content Scenario while the situation in which the panels and mounting are purchased outside of Ohio is considered the Base-Case Scenario.

State and county-level results of the analysis are displayed separately to enable easy identification of relevant impacts for both entities. These scenarios are mutually exclusive and are not intended to complement one another. For example, the High Ohio Content scenario will support a total of 1,253 jobs during the construction phase of the Facility, of which 504 are estimated to be in Preble County.

## Introduction

The construction and operation of the Angelina Solar Facility in Preble County, Ohio will generate economic and fiscal benefits to local governments and to the State of Ohio. The Economics Center has produced this analysis to quantify these benefits. This report is laid out in the following sections:

- Facility and location description
- Socioeconomic trends in Preble County
- Local impacts to housing and transportation
- Methodology
- Economic impacts of the constructions and operation of the Facility
- Fiscal impacts of the construction and operation of the Facility
- Supply chain analysis to identify which sectors benefit from the Facility
- Concluding Remarks

## Facility and Location Description

Angelina Solar I, LLC proposes to construct a 130 megawatt of direct current (MW<sub>DC</sub>)<sup>3</sup> capacity solar facility in Preble County, Ohio with a scheduled commercial operations date of December 2020. The Facility will include ground-mounted photovoltaic (PV) modules and associated support facilities, consisting of access roads, a pyranometer, buried electrical collection lines, inverter pads, a facility substation, and a short transmission line (“gen-tie”) that will connect the facility substation the existing utility substation. The Facility is expected to operate for 40 years and utilize thin film solar modules. In all, approximately 302,326 solar modules will be installed, each with approximately 0.42 kilowatts of direct current (KW<sub>DC</sub>) capacity. At the end of the Facility’s useful life, the land could be returned to agriculture or used for other developments as desired. As a result, is no expected environmental or development impact on the land.

The proposed Facility will be located in southwest Preble County, with the Facility located within Israel Township. Preble County is located in southwestern Ohio, north of the City of Cincinnati and west of the City of Dayton. As discussed below, the County is mostly rural with the manufacturing sector employing more than any other sector, primarily in fabricated metals and machinery manufacturing. The facility will be constructed to the southeast of the City of Eaton, which is the county seat and the most populous portion of Preble County.

## Socioeconomic Trends

### Socioeconomic Profile

Table 1 shows the population, workforce, and employment statistics from 1970 to 2016. The population of Preble County grew by approximately 21.9 percent between 1970 and 2000, but experienced stagnant growth between 2000 and 2010, according to the U.S. Census.<sup>4</sup> Since 2010, the population in the County decreased by approximately 709 people, or a decline of 1.7 percent. Overall, employment in the County peaked in 2000, when

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<sup>3</sup> The proposed Facility will be 130 MW<sub>DC</sub> or 100 MW of alternating current (MW<sub>AC</sub>). The entirety of this report measures electricity output as direct current power.

<sup>4</sup> (U.S. Census Bureau, 1970-2016)

20,560 people were employed from a total labor force of 21,479. In 2016, 19,414 people were employed out of total labor force of 20,789 individuals.

**Table 1: Preble County Population, Employment, and Workforce Statistics, 1970-2016**

| Year | Population | Working Age (15-64) | Labor Force | Employed | Unemployed |
|------|------------|---------------------|-------------|----------|------------|
| 1970 | 34,719     | 20,072              | 13,640      | 13,176   | 464        |
| 1980 | 38,223     | 23,965              | 17,076      | 15,819   | 1,257      |
| 1990 | 40,113     | 25,303              | 19,196      | 17,968   | 1,228      |
| 2000 | 42,337     | 27,034              | 21,479      | 20,560   | 919        |
| 2010 | 42,270     | 26,802              | 21,989      | 20,272   | 1,717      |
| 2011 | 42,394     | 26,970              | 21,798      | 19,908   | 1,890      |
| 2012 | 42,240     | 26,741              | 21,547      | 19,747   | 1,800      |
| 2013 | 42,050     | 26,596              | 21,105      | 19,298   | 1,807      |
| 2014 | 41,887     | 26,326              | 21,018      | 19,344   | 1,674      |
| 2015 | 41,682     | 26,114              | 20,830      | 19,308   | 1,522      |
| 2016 | 41,561     | 25,968              | 20,789      | 19,414   | 1,375      |

Source: U.S. Census Bureau Decennial Census and American Community Survey

Table 2 displays the projected population for the Eaton area as well as Preble County.<sup>5</sup> According to Emsi,<sup>6</sup> the population in both Preble County and the Eaton area is expected to decrease with the Eaton area's population decreasing by 1.0 percent between 2017 and 2027 and Preble County's population decreasing by 1.8 percent during the same period. Between 2007 and 2017, the Eaton area population decreased by 0.6 percent and Preble County's population decreased by 3.4 percent.

**Table 2: Population Projections for Eaton and Preble County**

| Area          | Zip Code | Population |        |        |
|---------------|----------|------------|--------|--------|
|               |          | 2007       | 2017   | 2027   |
| Eaton         | 45320    | 16,763     | 16,657 | 16,487 |
| Preble County | -        | 42,562     | 41,101 | 40,357 |

Source: EMSI Population and Demographics Data

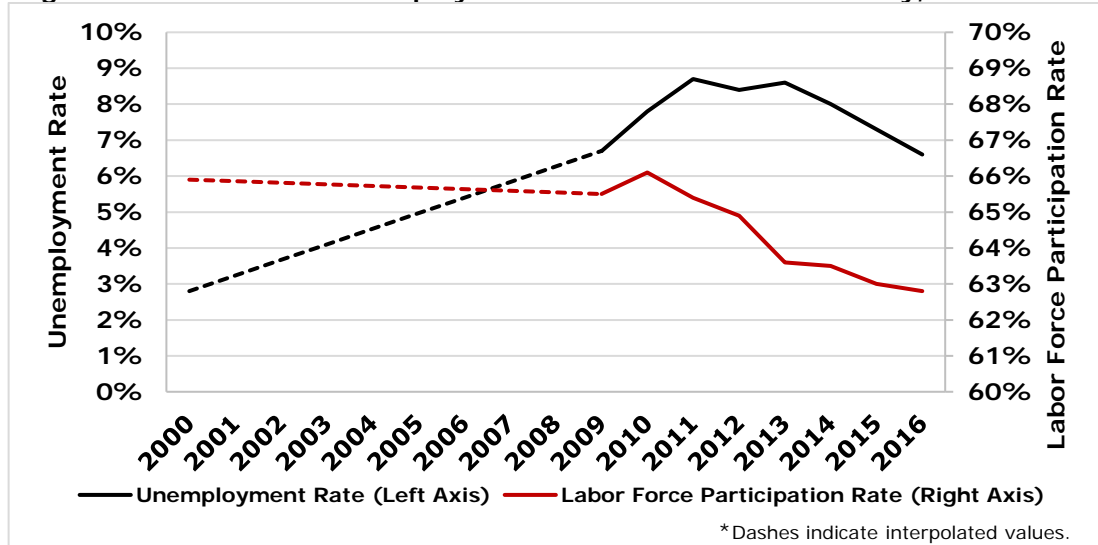
Despite an average annual increase in the labor force<sup>7</sup> between 2000 and 2010 of 0.24 percent, the labor force participation rate decreased by an average of 0.04 percent over the decade, as shown in Figure 1. However, the unemployment rate decreased to 6.6 percent in 2016 after increasing to a high of 8.7 percent in 2011. As a result, employment in Preble County was highest in 2000 and was at its lowest point between 2012 and 2015. However, 2016 saw some recovery in employment levels in the County.

<sup>5</sup> Population projections for Eaton consist of the zip code in which Eaton is located and differ somewhat from the City's boundaries.

<sup>6</sup> Emsi population estimates and projections may not coincide entirely with U.S. Census estimates.

<sup>7</sup> The labor force is the number of people of working age who are actively working or seeking employment.

**Figure 1: Labor Force and Employment Statistics for Preble County, 2000-2016<sup>8</sup>**



Source: U.S. Census Bureau Decennial Census and American Community Survey

## Industry Trends

Figure 2 and Table 3 display employment in Preble County<sup>9</sup> by major industry group while Figure 3 shows the average weekly wages in each respective sector. Between 1990 and 2017, employment in Preble County was highest in 2005, when an estimated 11,335 jobs were in the County. Employment in the County decreased during and after the Great Recession, falling to a low of 9,907 jobs in 2011. In 2017, employment in the County grew by 6.0 percent from 2011 levels to 10,497 jobs.

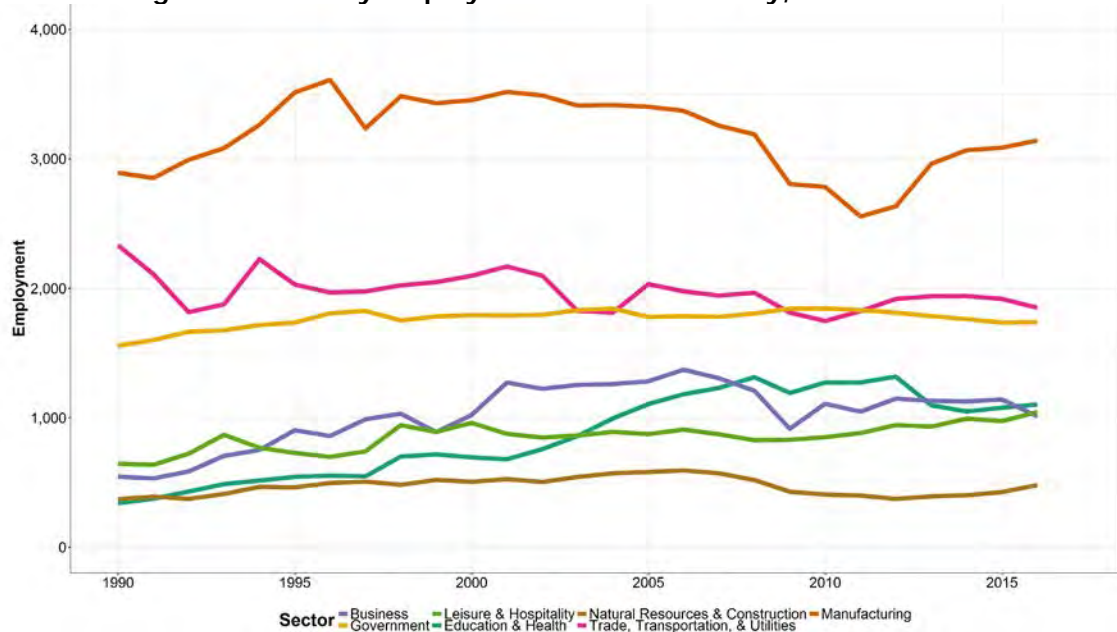
Manufacturing encompassed between 25.7 and 34.0 percent of total County jobs between 1990 and 2017 and has provided the highest wages of the major industry groups. However, manufacturing experienced the largest employment loss following the Great Recession as manufacturing jobs decreased from 3,402 in 2005 to 2,555 in 2011, or a decline of 847 jobs. Employment has recovered in manufacturing, as employment grew to 3,062 in 2017, an increase of 10.0 percent from 2011 levels.

Employment in the County remains lower than pre-recession levels as all sectors experienced lower employment in 2017 than in 2005 with the exception of education and health as well as leisure and hospitality. However, between 2010 and 2017, manufacturing, trade, leisure and hospitality, and natural resources and construction experienced positive post-recession growth while business, education and health, and government experienced decreased employment.

<sup>8</sup> Values are interpolated between 2000 and 2010.

<sup>9</sup> The Quarterly Census of Employment and Wages displays jobs within the County and does not account for Preble County residents who work in another county.

**Figure 2: Industry Employment in Preble County, 1990-2017**



Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages

**Table 3: Industry Employment in Preble County, 1990-2017**

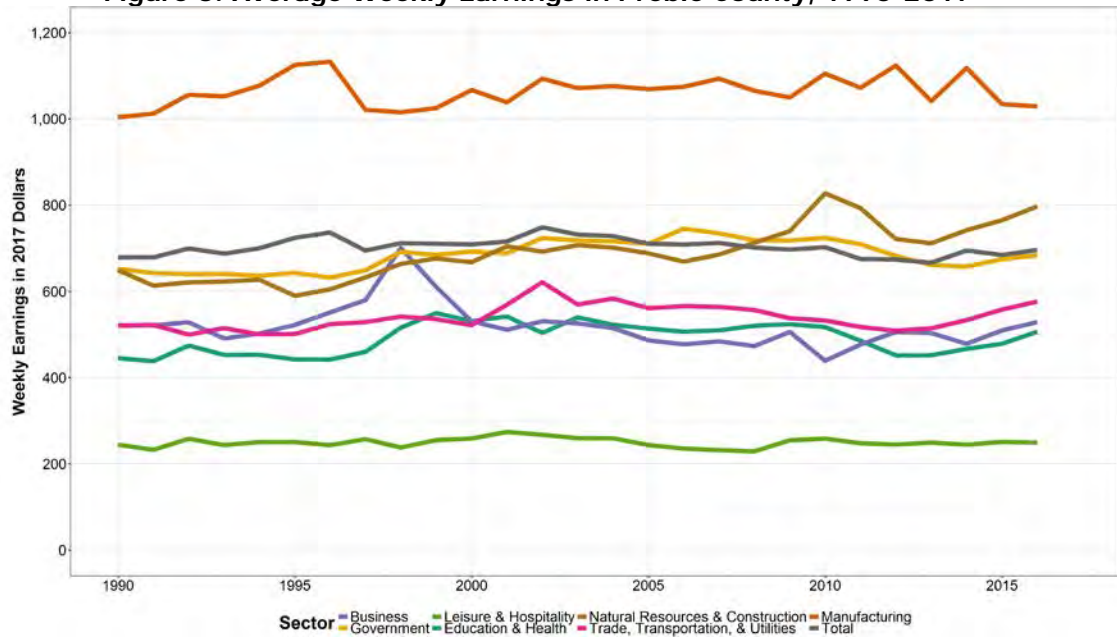
| Industry                           | Employment   |               |               |               |
|------------------------------------|--------------|---------------|---------------|---------------|
|                                    | 1990         | 2000          | 2010          | 2017          |
| Manufacturing                      | 2,893        | 3,454         | 2,784         | 3,062         |
| Trade, Transportation, & Utilities | 2,333        | 2,097         | 1,748         | 1,801         |
| Government                         | 1,557        | 1,793         | 1,845         | 1,761         |
| Education & Health                 | 340          | 694           | 1,272         | 1,192         |
| Business                           | 545          | 1,022         | 1,108         | 1,063         |
| Leisure & Hospitality              | 645          | 961           | 850           | 1,062         |
| Natural Resources & Construction   | 371          | 506           | 407           | 480           |
| <b>Total</b>                       | <b>8,684</b> | <b>10,527</b> | <b>10,014</b> | <b>10,421</b> |

Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages

Total average weekly earnings in Preble County have been stable since 1990 both overall and throughout most sectors. Average 2016 wages were \$696, but ranged from \$249 in leisure & hospitality to \$1,029 in manufacturing. Additionally, natural resources & construction wages—at \$797—were above the total average earnings in Preble County. Public employees earned \$683 on average, which was nearly the same as the total average. Employees from all other sectors earned between \$506 and \$577 on average. Average wages in Preble County were low compared to average wages throughout Ohio (\$915). With the exception of natural resource and construction occupations, which grew continually between 1990 and 2017, most individuals employed in Preble County saw real wage

declines following the Great Recession, specifically between 2011 and 2014. Since then, inflation-adjusted wages increased in all industries except manufacturing and leisure and hospitality, as shown in Figure 3.

**Figure 3: Average Weekly Earnings in Preble County, 1990-2017**



Source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages

## Local Impacts on Housing and Transportation

### Housing Impacts

Throughout Preble County there are an estimated 1,811 vacant housing units, accounting for 10.1 percent of all housing units, as shown in Table 4. Preble County's vacancy rate is comparable to the statewide vacancy rate of 10.6 percent. Of the vacant housing units, an estimated 285 are rental units. Vacancies are highest in the Census tract incorporating Somers Township and the eastern part of Gasper Township with 400 vacancies (20% vacancy rate), which is shown in Figure 4. Median gross monthly rent for the County is \$720, below the statewide figure of \$759 and gross monthly rent ranges from \$625 to \$1,124 throughout Preble County. The median housing value in Preble County—\$119,094—is also below the statewide median housing value of \$134,721. The housing burden rate, or the share of households with rent greater than 35 percent of household income, for the County (34.3%) is slightly lower than the rate for the State (36.0%).

**Table 4: Preble County Housing Occupancy and Value Characteristics, 2016**

| Location/Township      | Total Housing Units | Occupied Housing Units | Vacant Housing Units | Vacancy Rate | Median Housing Value of Owner-Occupied Units (2017 dollars) | Median Gross Rent (2017 dollars) |
|------------------------|---------------------|------------------------|----------------------|--------------|---|----------------------------------|
| Eaton                  | 3,717               | 3,401                  | 316                  | 8.5%         | \$98,768  | \$625                            |
| Harrison               | 1,935               | 1,704                  | 231                  | 11.9%        | \$124,813   | \$762                            |
| Somers and East Gasper | 1,929               | 1,529                  | 400                  | 20.7%        | \$105,714   | \$692                            |
| Gratis                 | 1,732               | 1,619                  | 113                  | 6.5%         | \$143,607   | \$741                            |
| West Gasper            | 1,540               | 1,372                  | 168                  | 10.9%        | \$121,035   | \$951                            |
| Jefferson              | 1,470               | 1,312                  | 158                  | 10.7%        | \$105,918   | \$660                            |
| Lanier                 | 1,421               | 1,366                  | 55                   | 3.9%         | \$126,346   | \$725                            |
| Jackson, Dixon, Israel | 1,286               | 1,156                  | 130                  | 10.1%        | \$129,819   | \$869                            |
| Twin                   | 1,151               | 1,109                  | 42                   | 3.6%         | \$148,306   | \$836                            |
| Monroe                 | 944                 | 826                    | 118                  | 12.5%        | \$96,011  | \$753                            |
| Washington             | 734                 | 654                    | 80                   | 10.9%        | \$186,403   | \$1,124                          |
| <b>Preble County</b>   | <b>17,859</b>       | <b>16,048</b>          | <b>1,811</b>         | <b>10.1%</b> | <b>\$119,094</b>  | <b>\$720</b>                     |
| <b>Ohio</b>            | <b>5,146,944</b>    | <b>4,601,449</b>       | <b>545,495</b>       | <b>10.6%</b> | <b>\$134,721</b>  | <b>\$759</b>                     |

Source: U.S. Census American Community Survey 5-year ACS data

While the Facility may have modest impacts in the rental housing market during construction and operations as a result of the influx of construction and installation workers, it is not expected to be a detriment to the housing market as a result of the available vacant housing within Preble County.

Population density varies considerably throughout Preble County, as shown in Table 5. Eaton, the county seat of Preble County, has a population density of 1,318 people per square mile. Israel Township, where most of the proposed project will be built, was the least densely populated portion of Preble County at 27 people per square mile. There were 97 people per square mile living in all of Preble County in 2016.

**Table 5: Preble County Population Density, 2016**

| <b>Location/Township</b> | <b>Population<br/>Density<br/>(People/sq. mi.)</b> |
|--------------------------|--|
| Eaton                    | 1,318  |
| West Gasper              | 351  |
| Harrison                 | 126  |
| Gratis                   | 118  |
| Lanier                   | 104  |
| Jefferson                | 92   |
| Twin                     | 78   |
| Somers and East Gasper   | 77   |
| Monroe                   | 62   |
| Washington               | 45   |
| Jackson, Dixon, Israel   | 27   |
| <b>Preble County</b>     | <b>97</b>  |

Source: U.S. Census American Community Survey 5-year ACS data

## Transportation Impacts

Preble County is interconnected with a variety of major and minor arterial roads that will allow access to the construction site without disrupting traffic flows within the area. Interstate 70 bisects the northern portion of Preble County and provides access to Interstates 71 and 75 to the east and Interstates 65 and 69 to the west. Arterials in the County include U.S. Route 127 and U.S. Route 35. Route 127 runs north-south through central Preble County, granting access to the Greater Cincinnati area. U.S. 40 provides alternative access to Dayton and Indianapolis if Interstate 70 is inaccessible or experiencing traffic delays. Further, Camden and Eaton host an active rail facility, which may provide more economical access to the materials needed to construct the Facility.<sup>10</sup>

## Compatibility with Local Economic Development Plans

The 2016 Preble County Comprehensive Economic Development Strategy and Land Use Plan, details land use within Preble County for agriculture, residential, industrial, commercial, recreational, and transportation developments. Preble County is primarily a rural area with cropland accounting for 72 percent of land area in the County. As such, preserving the farming industry was a top priority for maintaining the economic stability of the community. With this consideration, the Land Use Plan includes objectives to protect farm lands from the impacts of non-farm developments. Policies relevant to the Facility include:

- 1) Encouraging non-farm development in designated Urban Transitional Areas;
- 2) Assessing the environmental impacts of the development to protect agricultural productivity;

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<sup>10</sup> (Board of Preble County Commissioners, 2016)

- 3) Encouraging innovative energy conserving development;
- 4) Encouraging commercial and industrial growth as sources of employment;
- 5) Facilitating development of new commercial areas; and
- 6) Supporting programs that improve air quality and limit the emission of air pollutants.

The Facility is compatible and complementary to Preble County's Land Use Plan by directly and indirectly supporting the County's policy goals of encouraging non-farm development and encouraging employment growth in the commercial and industrial sectors, and creating a more-diversified economy as a new sector in the area. Given the low impact of the Facility, it is not expected to harm agricultural lands or productivity. Furthermore, the Facility will provide clean energy to local residents and businesses by reducing the reliance on polluting energy sources, potentially improving environmental quality. The construction of the Facility will support short-term jobs, while operations and management will provide long-term employment opportunities.

## **Economic Impact Methodology**

Economic impact figures represent the effects that a given development project and its associated economic activities have upon a surrounding community. Developments will affect local communities through the purchases of local goods and services made by the facilities and its employees. In turn, those local businesses and households purchase goods and services at local businesses.

The Economics Center calculated the impact of the Facility's construction using estimates of construction costs, the size and scope of the construction, and the requirements for the operation of the solar electricity generation facility, which were provided by Open Roads Renewables. These data were used in an input-output model, which measures goods and services produced in each industry and the use of those goods and services by other industries and households in a local area.

Input-output models give a picture of the direct and indirect impacts of a given business or organization. The direct impacts of the project are measured in terms of the total construction costs and operation of the site and in terms of the wages paid to employees hired with those monies. In turn, the construction and operations spending supports jobs and spending in other industries, which are the indirect impacts of the project's activity. Finally, the direct and indirect impacts of inter-industry relationships create induced impacts due to the spending of private households.

Multipliers are figures that represent all inter-industry and household economic relationships measured in the input-output model. For every dollar spent by a given organization in a particular industry, multipliers reflect how many more dollars will be spent in a local economy by other businesses and households, thereby determining the total economic impact of a project or investment. The multipliers reflect two sets of economic impacts: first, the direct effect number of jobs and wages; and second, the final effects, which add the indirect and induced impacts to the direct ones.

For this Facility, the bill of goods, or the industries and purchases necessary to construct the facility, were derived from the National Renewable Energy Laboratory's (NREL) Jobs

and Economic Development Impact Model (JEDI).<sup>11</sup> The JEDI model was created from interviews and partnerships with solar developers to create a model specific to the intricacies of solar energy project developments. The multipliers used in this Facility were provided by the Bureau of Economic Analysis' (BEA) Regional Industrial Multiplier System (RIMS II) to ensure the multipliers used were as current as possible.<sup>12</sup> Inflation adjustments for future years utilized the Office of Management and Budgets' Deflators.<sup>13</sup>

For fiscal impacts, the Economics Center utilized data from the Ohio Department of Taxation<sup>14</sup> to estimate taxes accruing to entities within Preble County and to the State of Ohio. The Economics Center assumed constant sales tax rates from the current rates. For local earnings taxes, the Economics Center generated a weighted tax rate based on the population of municipalities and school districts within Preble County, as it is currently unknowable to assess where in the County direct and indirect employees supported by the Angelina Solar Facility will live. Fiscal impacts are not included in the economic impact section of this report.

## Economic Impacts

### Impact on the State of Ohio

#### High Ohio Content Scenario – Construction Phase

Table 6 displays the estimated economic impact of the Angelina Solar Facility on the State of Ohio if the solar panels, mounting, and electrical wiring are manufactured in Ohio or purchased within Ohio. The equipment purchases and cost of construction in this scenario are estimated to require approximately \$98.7 million in direct expenditures, of which approximately \$80.4 million will occur in Ohio. The \$80.4 million in construction expenditures in Ohio will lead to further spending of \$81.4 million, resulting in total increased output within the State of Ohio of \$161.8 million.

**Table 6: Construction Impacts on the State of Ohio – High Ohio Content Scenario**

| Type         | Output               | Earnings            | Employment   |
|--------------|----------------------|---------------------|--------------|
| Direct       | \$80,407,597         | \$32,843,729        | 519          |
| Indirect     | \$81,355,717         | \$22,758,566        | 557          |
| <b>Total</b> | <b>\$161,763,314</b> | <b>\$55,602,295</b> | <b>1,076</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

The construction of the proposed Angelina Solar Facility will directly support 519 full- and/or part-time jobs.<sup>15</sup> Of the 519 direct jobs supported under the High Ohio Content Scenario, 290 will be directly employed at the project site in the Construction/Installations industry. The 519 direct jobs will support a further 557 full- and/or part-time jobs within the State of Ohio. Direct employees will earn approximately \$63,300 annually, on average while

<sup>11</sup> (National Renewable Energy Laboratory, 2014)

<sup>12</sup> (Bureau of Economic Analysis, 2017)

<sup>13</sup> (Office of Management and Budget, 2018)

<sup>14</sup> (Ohio Department of Taxation, 2017); (Ohio Department of Taxation, 2017)

<sup>15</sup> The RIMS II multipliers used in this analysis do not distinguish between full- and part-time jobs. The jobs presented in this analysis are represented as jobs over the course of one year.

indirect employees will earn \$40,900 annually, on average. Of the 557 indirect jobs supported by the project, 144 will be supported by the Construction/Installations industry, 229 indirect jobs will be supported from Semiconductor Manufacturing (which includes solar panels), and 73 will be supported by the Fabricated Metals Manufacturing. A breakdown of direct, indirect and total employment by economic sector supported during the construction phase under the High Ohio Content Scenario is detailed in Table 7.

**Table 7: Employment by Economic Sector in the State of Ohio, High Ohio Content Scenario- Construction Phase**

| Industry                               | Jobs       |            |              |
|--|------------|------------|--------------|
|  | Direct     | Indirect   | Total        |
| Construction/Installations             | 290        | 144        | 434          |
| Fabricated Metals                      | 35         | 73         | 108          |
| Energy Wire Manufacturing              | 8          | 19         | 27           |
| Wholesale Trade                        | 35         | 55         | 90           |
| Retail Trade                           | 16         | 10         | 26           |
| Transportation and Utilities           | 2          | 5          | 7            |
| Office Services                        | 13         | 12         | 25           |
| Architectural and Engineering Services | 1          | 1          | 2            |
| Other Services                         | 13         | 9          | 22           |
| Government                             | 0          | 0          | 0            |
| Semiconductor Manufacturing            | 106        | 228        | 334          |
| <b>Total</b>                           | <b>519</b> | <b>557</b> | <b>1,076</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. Values may not sum due to rounding.

### High Ohio Content Scenario – Operations Phase

During the operations phase of the Angelina Solar Facility, operation and maintenance activities will increase economic output in the State of Ohio by nearly \$574,000 annually and directly employ 11 full- and/or part-time technicians, managers, and others as a result of the generation site, as shown in Table 8. The direct spending will generate an additional indirect impact of nearly \$1.8 million within the State of Ohio, for a total annual impact of approximately \$2.3 million. The 11 direct employees are expected to earn approximately \$52,140 annually while the 11 indirect employees supported by the Facility's operations will earn approximately \$41,700 each year. Overall, 22 full- and/or part-time jobs are expected to be supported each year during the operation of the Angelina Solar Facility.

**Table 8: Operations Impacts on the State of Ohio – High Ohio Content Scenario**

| Type         | Output             | Earnings         | Employment |
|--------------|--------------------|------------------|------------|
| Direct       | \$573,542          | 573,542          | 11         |
| Indirect     | \$1,773,180        | \$478,938        | 11         |
| <b>Total</b> | <b>\$2,346,722</b> | <b>1,052,480</b> | <b>22</b>  |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

### Base-Case Scenario – Construction Phase

Under the scenario in which the solar modules and mounting are neither purchased from nor manufactured by an Ohio-based company, the total economic benefits to Ohio during the construction of the Angelina Solar Facility will be approximately \$50.2 million, as shown in Table 9. The Facility will require direct expenditures of more than \$21.9 million within the State of Ohio for construction and the purchases of other materials. These direct purchases will cause a further \$28.3 million in indirect impact within the State for a total economic output of \$50.2 million.

**Table 9: Construction Impacts on the State of Ohio – Base-Case Scenario**

| Type         | Output              | Earnings            | Employment |
|--------------|---------------------|---------------------|------------|
| Direct       | \$21,907,597        | \$17,672,405        | 327        |
| Indirect     | \$28,265,306        | \$7,692,658         | 191        |
| <b>Total</b> | <b>\$50,172,903</b> | <b>\$25,365,063</b> | <b>518</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

Approximately 327 full- and/or part-time jobs will be directly supported in the State of Ohio during the Facility's construction, under the Base-Case Scenario, with average annual earnings of \$54,000. Of those 327 direct jobs, 290 will be directly employed at the project site in Preble County in the Construction/Installation Industry. The 191 indirect jobs supported by the construction of the Facility will earn annual wages of approximately \$40,275, on average. Of the 191 indirect jobs supported by the project, 144 will be supported by the Construction/Installations industry, 19 indirect jobs will be supported from Energy Wire Manufacturing, and five will be supported by the Wholesale Trade Industry. A breakdown of direct, indirect and total employment by economic sector supported during the construction phase under the Base-Case Content Scenario is detailed in Table 10.

**Table 10: Employment by Economic Sector in the State of Ohio, Base-Case Scenario- Construction Phase**

| Industry                               | Jobs       |            |            |
|--|------------|------------|------------|
|  | Direct     | Indirect   | Total      |
| Construction/Installations             | 290        | 144        | 434        |
| Fabricated Metals                      | 0          | 0          | 0          |
| Energy Wire Manufacturing              | 8          | 19         | 27         |
| Wholesale Trade                        | 3          | 5          | 8          |
| Retail Trade                           | 0          | 0          | 0          |
| Transportation and Utilities           | 0          | 0          | 0          |
| Office Services                        | 12         | 13         | 25         |
| Architectural and Engineering Services | 1          | 1          | 2          |
| Other Services                         | 13         | 9          | 22         |
| Government                             | 0          | 0          | 0          |
| Semiconductor Manufacturing            | 0          | 0          | 0          |
| <b>Total</b>                           | <b>327</b> | <b>191</b> | <b>518</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns.

### Base-Case Scenario – Operations Phase

Under this scenario, the operations expenditures of the proposed facility will employ 11 technicians and other workers within the State of Ohio with average annual wages of \$52,140. The expenditures necessary to maintain the Facility will increase output in Ohio by approximately \$574,000 each year, as shown in Table 11. These direct expenditures will lead to a further \$960,400 in purchases each year and will support eight full- and/or part-time jobs in Ohio, earning approximately \$37,770, on average. In total, Ohio's economy will benefit from more than \$1.5 million in increased economic activity and 19 full- and/or part-time jobs with nearly \$857,000 in earnings.

**Table 11: Operations Impacts on the State of Ohio – Base-Case Scenario**

| Type         | Output             | Earnings         | Employment |
|--------------|--------------------|------------------|------------|
| Direct       | \$573,542          | \$573,542        | 11         |
| Indirect     | \$960,403          | \$283,401        | 8          |
| <b>Total</b> | <b>\$1,533,945</b> | <b>\$856,943</b> | <b>19</b>  |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

## Impact on Preble County

### Construction Phase

The economic impacts of the construction phase of the Angelina Solar Facility on Preble County are shown in Table 12. The construction of the Facility will require the direct expenditures of \$19.1 million in the Preble County economy and directly support 311 full-and/or part-time workers during the construction phase.<sup>16</sup> The direct expenditures for the construction of the Facility, in turn, will cause the further spending of \$5.7 million for a total impact in Preble County of \$24.8 million. The workers directly engaged in the construction of the Facility are estimated to earn an average wage of approximately \$54,490 annually, while the 41 indirect employees supported by the Facility's construction will earn \$34,496, annually, on average.

**Table 12: Construction Impacts on Preble County**

| Type         | Output              | Earnings            | Employment |
|--------------|---------------------|---------------------|------------|
| Direct       | \$19,110,000        | \$16,947,112        | 311        |
| Indirect     | \$5,691,204         | \$1,414,350         | 41         |
| <b>Total</b> | <b>\$24,801,204</b> | <b>\$18,361,462</b> | <b>352</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

As shown in Table 13, of those 311 direct jobs, 290 will be directly employed at the project site in the Construction/Installation Industry. Of the 41 indirect jobs supported by the project, 37 will be supported by the Construction/Installations industry, 2 indirect jobs will be supported each in the Office Services and Other Services Industries. A breakdown of direct, indirect and total employment by economic sector supported during the construction phase under the Base-Case Content Scenario is detailed in Table 10.

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<sup>16</sup> This scenario assumes that the mounting, solar modules, electrical equipment, inverters, and other supplies are manufactured and purchased from entities outside of Preble County. Approximately 50 percent of permitting costs are assumed to occur within Preble County.

**Table 13: Employment by Economic Sector in Preble County, Construction Phase**

| Industry                               | Jobs       |           |            |
|--|------------|-----------|------------|
|  | Direct     | Indirect  | Total      |
| Construction/Installations             | 290        | 37        | 327        |
| Fabricated Metals                      | 0          | 0         | 0          |
| Energy Wire Manufacturing              | 0          | 0         | 0          |
| Wholesale Trade                        | 1          | 0         | 1          |
| Retail trade                           | 0          | 0         | 0          |
| Transportation and Utilities           | 0          | 0         | 0          |
| Office Services                        | 9          | 2         | 11         |
| Architectural and Engineering Services | 1          | 0         | 1          |
| Other services                         | 10         | 2         | 12         |
| Government                             | 0          | 0         | 0          |
| Semiconductor manufacturing            | 0          | 0         | 0          |
| <b>Total</b>                           | <b>311</b> | <b>41</b> | <b>352</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns.

### Operations Phase

The operation of the facility will employ approximately 11 individuals as technicians, managers, and other administrative functions and will cause approximately \$574,000 annually in expenditures in Preble County, as shown in Table 14. Because all of the equipment necessary for the maintenance of the plant are assumed to be purchased outside of Preble County, the earnings of the employees at the facility are equivalent to the expected economic output of the facility. On average, Facility employees are estimated to earn \$52,490 annually while the indirect employees supported by the take-home pay of Angelina employees are estimated to earn \$28,190 each year. The project site's landowners will further benefit from the project through \$ [REDACTED] annually in lease payments for the use of the land.

**Table 14: Operations Impacts on Preble County**

| Type         | Output           | Earnings          | Employment |
|--------------|------------------|-------------------|------------|
| Direct       | \$574,422        | \$573,542         | 11         |
| Indirect     | \$211,976        | \$56,378          | 2          |
| <b>Total</b> | <b>\$785,518</b> | <b>\$ 629,920</b> | <b>13</b>  |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

## Fiscal Impacts

In addition to the economic benefits demonstrated above, the proposed Angelina Solar Facility in Preble County will benefit local schools, municipal governments, county governments, and the State of Ohio through payments made in lieu of property taxes, as well as the sales and earnings taxes paid by the direct and indirect employees of the solar facility.

An estimated \$719,200 is expected to be paid to Preble County each year for the duration of the life of the Facility as payments in lieu of taxes (PILOT), shown in Table 15. According to the Ohio Revised Code Chapter 5727, certain solar facilities are exempt from tangible personal property and real property tax. Instead, annual payments in lieu of these taxes are required to be paid to the County Treasurer each year.<sup>17</sup>

**Table 15: Payments in Lieu of Property Taxes**

| Government Entity | Payment   |
|-------------------|-----------|
| Preble County     | \$719,200 |

Source: Angelina Solar I, LLC

Table 16 quantifies the fiscal benefits to state and local entities under the High Ohio Content Scenario, in which the solar panels and racking are purchased within Ohio while Table 17 displays the fiscal benefits under the scenario where the panels and racking are purchased outside of Ohio. According to the Ohio Department of Taxation, sales taxes are not levied on purchases made for electricity generation facilities.<sup>18</sup> Therefore, the sales tax estimates shown are purely the result of the take-home pay of the employees supported by the construction and operation of the facility.

The fiscal benefits of the proposed Facility will largely accrue during the construction phase of the Facility but will continue throughout the life of the Facility. Under the High Ohio Content Scenario, the State of Ohio is estimated to receive \$869,620 in sales tax revenues during the construction phase of the Facility and more than \$1.7 million in earnings taxes. Once in operation, the State of Ohio is expected to receive approximately \$41,000 each year, \$16,461 in sales taxes and \$24,195 in earnings taxes. Schools in Preble County are estimated to receive approximately \$250,000 during construction, and nearly \$8,500 annually once the site is in operation. Local jurisdictions will benefit from an estimated \$114,600 in tax revenues during the construction phase and nearly \$4,000 annually during the Facility's operation.

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<sup>17</sup> (LAWriter, 2006)

<sup>18</sup> (Ohio Department of Taxation, 2017)

**Table 16: Sales and Earnings Tax Impact of the High Ohio Content Scenario**

| Phase        | Type                | Sales     | Earnings    | Total              |
|--------------|---------------------|-----------|-------------|--------------------|
| Construction | Schools             | \$0       | \$248,995   | <b>\$248,995</b>   |
|              | Local Jurisdictions | \$74,915  | \$39,661    | <b>\$114,576</b>   |
|              | State               | \$869,620 | \$1,715,748 | <b>\$2,585,368</b> |
| Operations   | Schools             | \$0       | \$8,542     | <b>\$8,542</b>     |
|              | Local Jurisdictions | \$2,570   | \$1,361     | <b>\$3,931</b>     |
|              | State               | \$16,461  | \$24,195    | <b>\$40,656</b>    |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

Because the equipment necessary for the operation of the Angelina Solar Facility is assumed to not be manufactured nor purchased within Preble County, there is no assumed difference in the fiscal impact accruing to school and local municipal entities in the County. However, the State of Ohio is estimated to receive approximately \$1.0 million as a result of the construction of the Facility under the Base-Case Scenario and nearly \$34,000 in earnings and sales tax revenues each year during the operations phase of the Facility. Annually, while the Facility is anticipated to generate an estimated \$8,542 for the local schools and another \$3,931 for local jurisdictions due to its operations expenditures.

**Table 17: Sales and Earnings Tax Impact of the Base-Case Scenario**

| Phase        | Type                | Sales     | Earnings  | Total              |
|--------------|---------------------|-----------|-----------|--------------------|
| Construction | Schools             | \$0       | \$248,995 | <b>\$248,995</b>   |
|              | Local Jurisdictions | \$74,915  | \$39,661  | <b>\$114,576</b>   |
|              | State               | \$396,710 | \$607,675 | <b>\$1,004,385</b> |
| Operations   | Schools             | \$0       | \$8,542   | <b>\$8,542</b>     |
|              | Local Jurisdictions | \$2,570   | \$1,361   | <b>\$3,931</b>     |
|              | State               | \$13,403  | \$20,506  | <b>\$33,909</b>    |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns. All monetary figures are in 2017 dollars.

## Supply Chain Analysis

The solar industry indirectly supports numerous economic sectors throughout the United States. Table 18, below, shows the industry purchases of the solar electric industry (NAICS 221114) within the United States in 2017, according to Emsi. Inter-industry purchases within Ohio are not currently available due to the nascent status of the solar electric industry within the state. As the businesses the solar industry supports through their purchases buy goods and services purchase goods themselves, other industries benefit from the growth of the solar industry throughout the United States. For example, solar energy developers indirectly support the providers of the raw materials that are required to manufacture solar panels, electrical equipment, and other supplies beyond the direct suppliers of the solar industry.

The economic sectors that benefitted most in 2017 from the solar electricity industry in the United States are transportation and warehousing (18.2%), manufacturing (17.4%), and mining, quarrying, and oil and gas extraction (16.5%). Together, these top three industries supported by the solar electricity industry receive more than half of the purchases.

**Table 18: Solar Electric Purchases in the United States, 2017**

| <b>NAICS</b> | <b>Industry</b>  | <b>Purchases</b>     | <b>% of Total</b> |
|--------------|--|----------------------|-------------------|
| 48           | Transportation and Warehousing   | \$77,954,340         | 18.2%             |
| 31           | Manufacturing  | \$74,460,597         | 17.4%             |
| 21           | Mining, Quarrying, and Oil and Gas Extraction                            | \$70,865,299         | 16.5%             |
| 54           | Professional, Scientific, and Technical Services                         | \$43,961,040         | 10.3%             |
| 56           | Administrative and Support and Waste Management and Remediation Services | \$30,167,417         | 7.0%              |
| 52           | Finance and Insurance  | \$26,092,502         | 6.1%              |
| 23           | Construction   | \$25,770,456         | 6.0%              |
| 42           | Wholesale Trade  | \$18,757,416         | 4.4%              |
| 53           | Real Estate and Rental and Leasing                                       | \$14,845,814         | 3.5%              |
| 22           | Utilities  | \$12,692,858         | 3.0%              |
| 51           | Information  | \$11,985,238         | 2.8%              |
| 72           | Accommodation and Food Services  | \$9,742,214          | 2.3%              |
| 44           | Retail Trade   | \$4,757,099          | 1.1%              |
| 11           | Agriculture, Forestry, Fishing and Hunting                               | \$1,673,106          | 0.4%              |
| 71           | Arts, Entertainment, and Recreation                                      | \$1,594,040          | 0.4%              |
| 61           | Educational Services   | \$1,047,795          | 0.2%              |
| 81           | Other Services (except Public Administration)                            | \$901,967            | 0.2%              |
| 90           | Government   | \$621,025            | 0.1%              |
| 55           | Management of Companies and Enterprises                                  | \$328,865            | 0.1%              |
| 62           | Health Care and Social Assistance  | \$295,751            | 0.1%              |
| <b>Total</b> |  | <b>\$428,514,839</b> | <b>100%</b>       |

## Conclusion

The construction and operation of a solar electricity generation facility in Preble County will provide benefits to the local and state economy as well as benefit local, county, and state governments through increased tax revenues. The construction impacts will consist of one-time benefits of \$175.3 million if most of the composite materials are manufactured and made in Ohio, or \$64.0 million if the panels and racking are purchased and manufactured elsewhere. Preble County will experience increased economic activity of \$32.7 million during the construction phase and approximately \$790,000 each year during the operation of the Facility.

The Angelina Solar Facility will benefit local and state governments through increased tax revenues. The construction phase will generate up to \$2.9 million in one-time tax revenues to local, County, and State governments. Additionally, operations expenditures will provide local jurisdictions and the State with up to approximately \$53,000 each year for the expected 40-year life of the Facility. Lastly, Preble County will receive an annual PILOT of \$719,200 from the Angelina Solar Facility and participating landowners will receive annual payments of approximately \$[REDACTED]. The Angelina Solar Facility has the opportunity to generate positive economic benefits to Preble County and Ohio by increasing economic activity, diversifying local income, and providing clean renewable energy to the electric grid.

## Appendix A: Industry Employment

**Table 19: Construction Phase Employment by Economic Sector**

| Industry                               | Preble County |           |            | Ohio Base-Case |            |            | Ohio High Content |            |              |
|--|---------------|-----------|------------|----------------|------------|------------|-------------------|------------|--------------|
|  | Direct        | Indirect  | Total      | Direct         | Indirect   | Total      | Direct            | Indirect   | Total        |
| Construction/Installations             | 290           | 37        | 327        | 290            | 144        | 434        | 290               | 144        | 434          |
| Fabricated Metals                      | 0             | 0         | 0          | 0              | 0          | 0          | 35                | 73         | 108          |
| Energy Wire Manufacturing              | 0             | 0         | 0          | 8              | 19         | 27         | 8                 | 19         | 27           |
| Wholesale Trade                        | 1             | 0         | 1          | 3              | 5          | 8          | 35                | 55         | 90           |
| Retail Trade                           | 0             | 0         | 0          | 0              | 0          | 0          | 16                | 10         | 26           |
| Transportation and Utilities           | 0             | 0         | 0          | 0              | 0          | 0          | 2                 | 5          | 7            |
| Office Services                        | 9             | 2         | 11         | 12             | 13         | 25         | 13                | 12         | 25           |
| Architectural and Engineering Services | 1             | 0         | 1          | 1              | 1          | 2          | 1                 | 1          | 2            |
| Other services                         | 10            | 2         | 12         | 13             | 9          | 22         | 13                | 9          | 22           |
| Government                             | 0             | 0         | 0          | 0              | 0          | 0          | 0                 | 0          | 0            |
| Semiconductor Manufacturing            | 0             | 0         | 0          | 0              | 0          | 0          | 106               | 228        | 334          |
| <b>Total</b>                           | <b>311</b>    | <b>41</b> | <b>352</b> | <b>327</b>     | <b>191</b> | <b>518</b> | <b>519</b>        | <b>557</b> | <b>1,076</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns.

**Table 20: Operations Phase Employment by Economic Sector**

| Industry                  | Preble County |          |           | Ohio Base-Case |          |           | Ohio High Content |           |           |
|---------------------------|---------------|----------|-----------|----------------|----------|-----------|-------------------|-----------|-----------|
|                           | Direct        | Indirect | Total     | Direct         | Indirect | Total     | Direct            | Indirect  | Total     |
| Electrical Equipment      | 0             | 0        | 0         | 0              | 0        | 0         | 0                 | 2         | 2         |
| Insurance and Real Estate | 0             | 0        | 0         | 0              | 2        | 2         | 0                 | 2         | 2         |
| Office Services           | 0             | 0        | 0         | 0              | 3        | 3         |                   | 3         | 3         |
| Other services            | 0             | 2        | 2         | 0              | 3        | 3         | 0                 | 4         | 4         |
| Plant Employees           | 11            | 0        | 11        | 11             | 0        | 11        | 11                | 0         | 11        |
| <b>Total</b>              | <b>11</b>     | <b>2</b> | <b>13</b> | <b>11</b>      | <b>8</b> | <b>19</b> | <b>11</b>         | <b>11</b> | <b>22</b> |

Source: Economics Center calculations using NREL JEDI model, RIMS II multipliers, and Emsi inter-sectoral purchasing patterns.

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Summary: Application Exhibit C electronically filed by Mr. Michael J. Settineri on behalf of Angelina Solar I, LLC