PIKE COUNTY
SOLAR PROJECT

Tab 10
Economic Impact

TAB 10 ECONOMIC IMPACT

KRS 278.706(2)(j) An analysis of the proposed facility's economic impact on the affected region and the state.

The results of the economic impact analysis conducted by Paul A. Combs, Ph.D, Consulting Economist from the University of Louisville, suggest that construction and operation of the Facility will have a positive economic impact statewide and on Pike County through job creation and resulting induced impacts, supply chain impacts, lease payments to private landowners, and payment-in-lieu-of-taxes (PILOT) payments to local taxing jurisdictions. The Facility will not impose significant additional burdens on local services and thus will not increase costs to the communities in the region. The results of this analysis are documented in the Estimated Economic Impact of Pike County Solar Project Report, which is included with this Tab as Attachment G.

Attachments:

- Attachment G: Estimated Economic Impact of Pike County Solar Project Report (16 pages)

PIKE COUNTY
SOLAR PROJECT

Attachment G

Estimated Economic Impact of Pike County Solar project

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Draft: April 17, 2024

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RE: Estimated economic impact of Pike County Solar Project

Executive Summary

Pike County Solar Project, LLC is developing a 100 Megawatt (MW) alternating current photovoltaic solar power plant, known as the Pike County Solar Project (Project), on 1,543 acres of reclaimed surface mine land northeast of Pikeville, in Pike County Kentucky[1]. This note provides estimates of the new local economic and fiscal activity expected from the development.

There are two primary impacts expected from the Project. First, there will be a spike in construction and linked jobs as the site is built out over twelve to fifteen months. Using estimates of the construction payroll, I estimate that there will be a total of 328 new jobs (240 direct plus 88 spinoff) in Pike County in year one, with new labor compensation of $17.8 million.

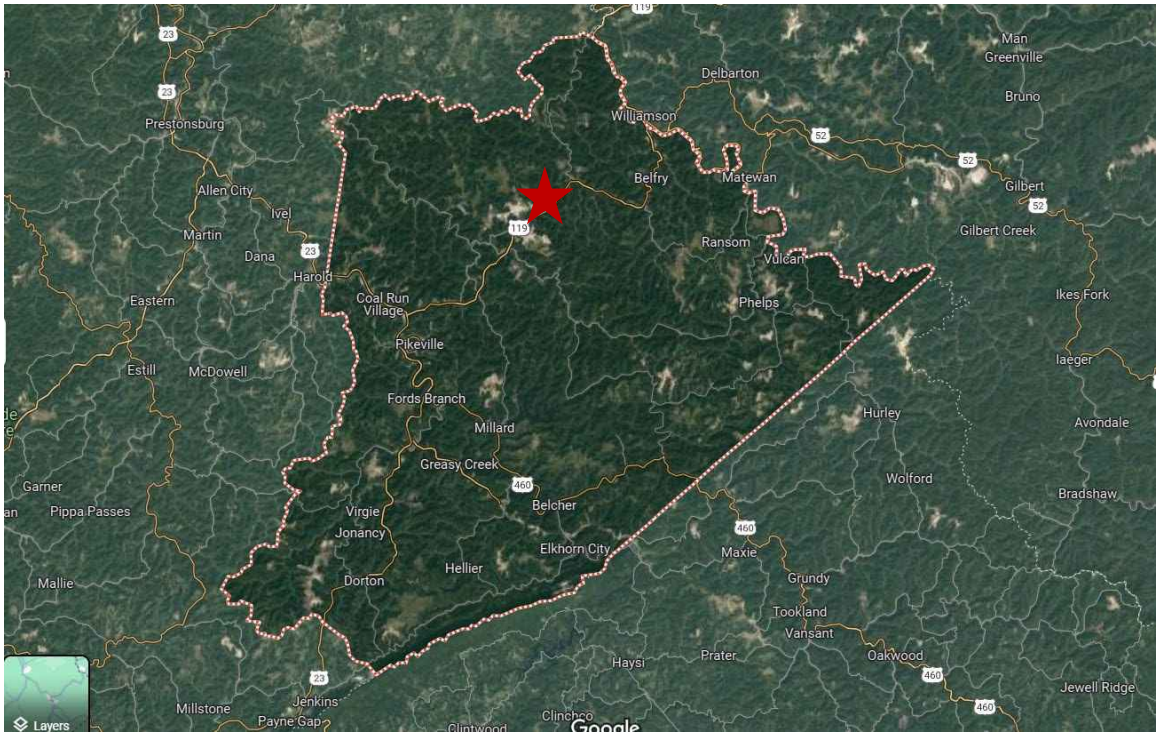
The Pike County Fiscal Court levies an occupational tax of one percent on employees' wages, salaries and other compensation. If all the estimated construction-related compensation were taxed, this would yield a one-time increase of $178,000 in new tax revenue and the operations and maintenance of the facility would yield about $6,000 in occupational tax revenues annually over the life of the project.

[1] www.pikecountysolarproject.com/

Demographic and Economic Characteristics of Pike County

Pike County is located in far eastern Kentucky, on the border of West Virginia and Virginia. The solar site is southwest of the community of Sidney and about 15 miles northeast of the city of Pikeville, the county seat. One can see the basic geography in Figure 1. The red star indicates the approximate location of the proposed Project.

Figure 1



The company also provided me with a general site map, shown in Figure 2 with the project outlined in red. One can see that the site is mountainous and not agricultural.

Figure 2

Newly released results from the 2022 American Community Survey provide a nice summary of demographic and economic characteristics of Pike County. Some details are provided in an appendix to this report. For many of the measures, the county is similar to the state of Kentucky, for example median age, persons per household, and commute times. However, the county differs from the state average in a few areas:

- Compared to the Kentucky state average, the county population is older, more likely to be classified as white/Caucasian, more likely to have a disability and less likely to be foreign-born.
- Few adults have a four-year college degree, and a larger percentage of adults are not in the labor force.
- Residents tend to work disproportionately in health care industries, and less likely to work in manufacturing and agricultural industries.
- Median household income was $41,300, compared to a state average of $60,200.

Pike County's population has been slowly declining over the past several decades, and there are now around 56,000 residents (Figure 3). The population peaked in 1983, with 82,000 residents. This demographic pattern is somewhat correlated with the number of jobs in the county, as is evident in Figure 4. Pike County lost on net around 5,000 jobs over the last two decades.

Figure 3

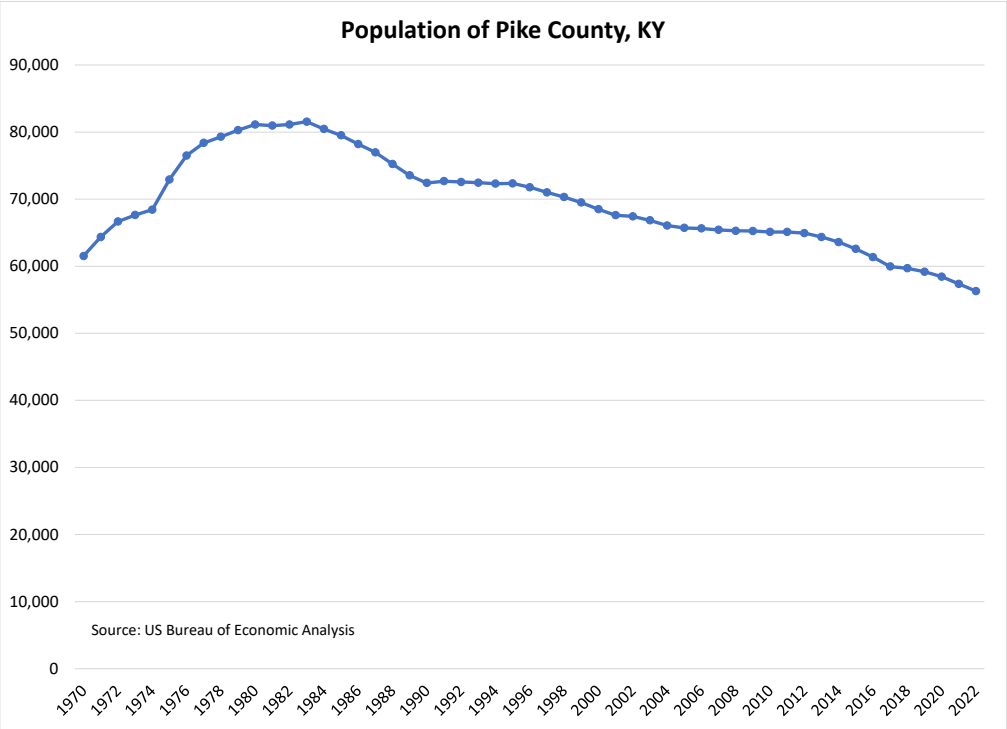
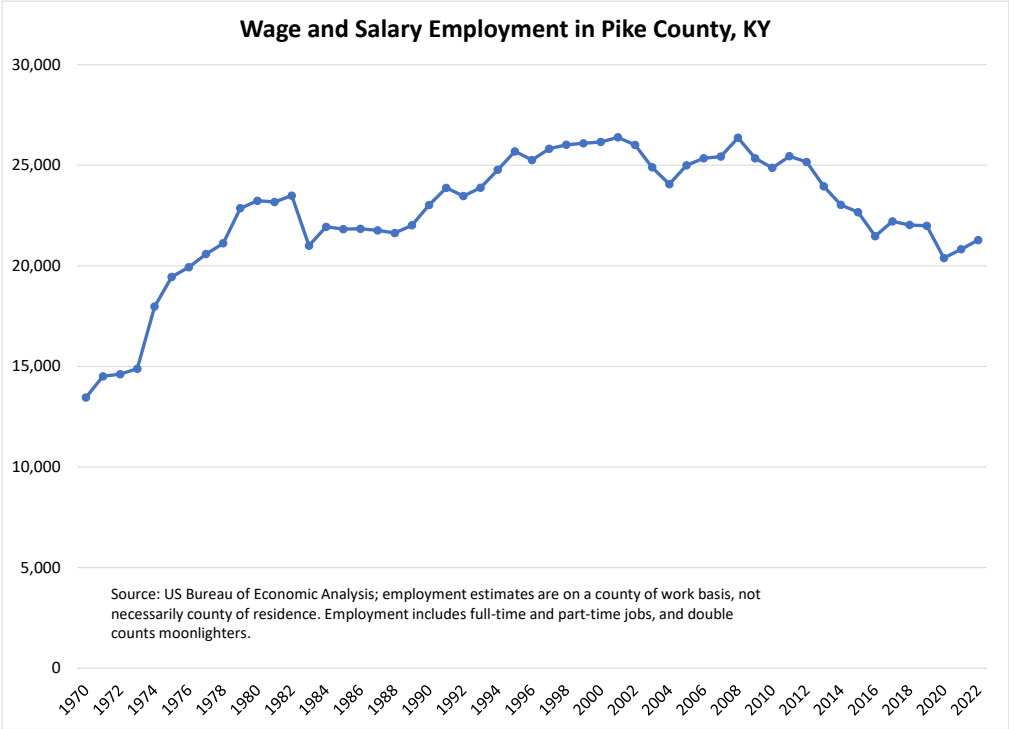


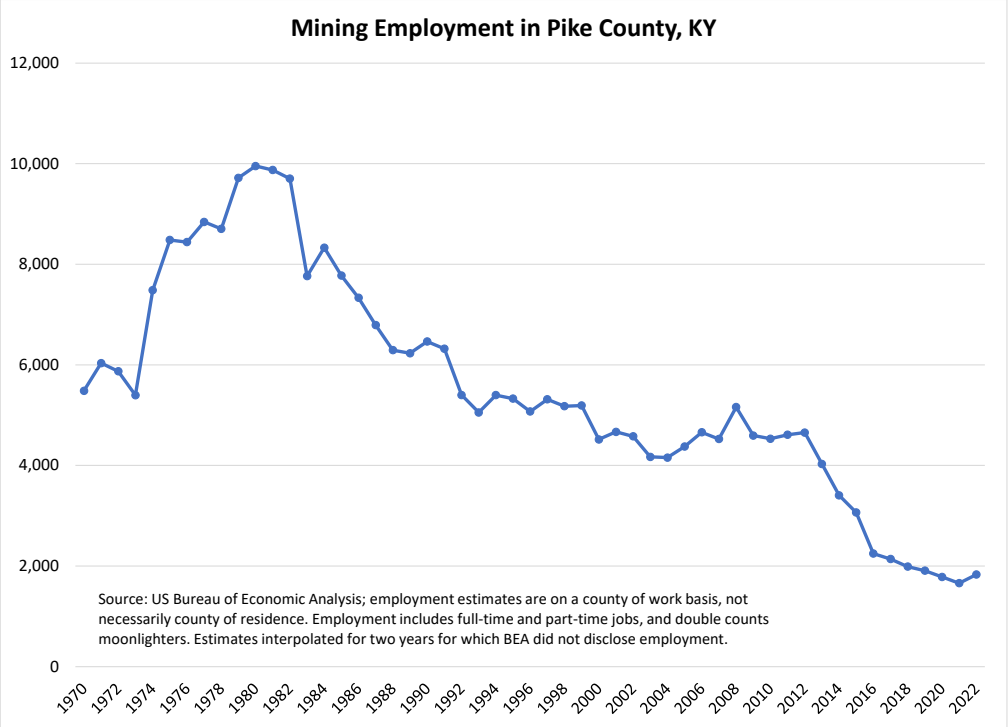
Figure 4



The severe loss in coal mining jobs since 1980, as shown in the Figure 5, was partially offset by growth in health care and education jobs. At its peak in 1980, Pike County

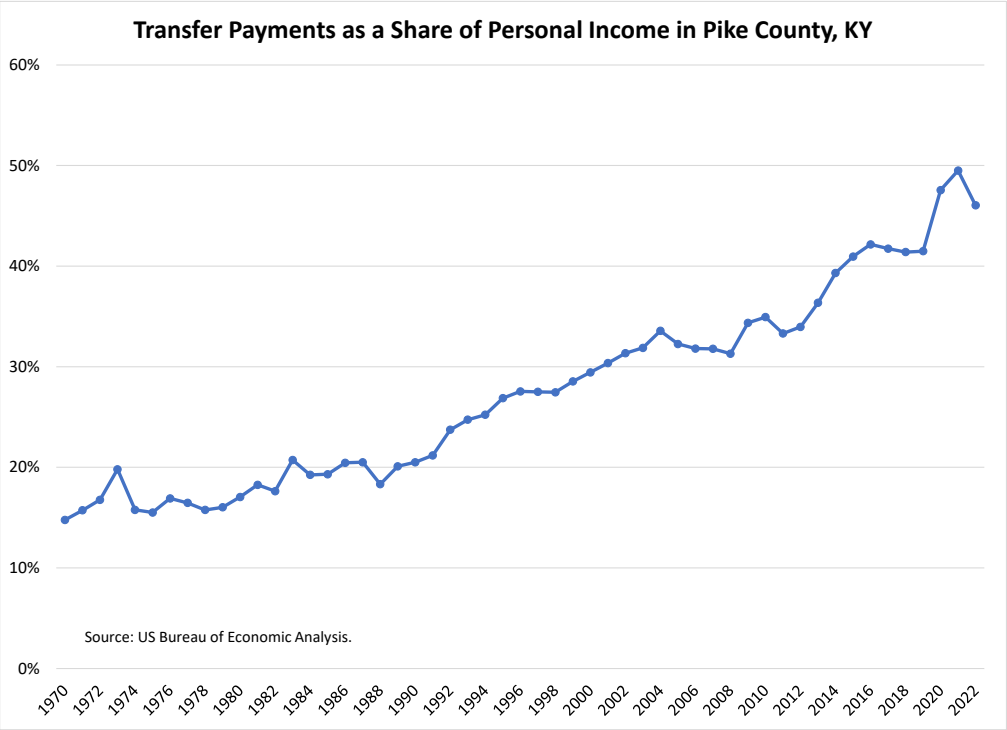
supported 10,000 mining jobs (Figure 5); by 2022 the number was less than 2,000. These jobs paid well, and at its peak coal mining accounted for 59 percent of earnings of workers and proprietors in the county. Unfortunately, there has not been sufficient growth in other industries to offset the loss of coal mining jobs.

Figure 5



It is clear from historical data on personal income that the county residents are very dependent on income from government transfer payments (Figure 6). It is the fastest growing component of personal income in Pike County. The share of residents' personal income from government transfer payments rose from 15 to 46 percent over the last five decades. The value of those transfer payments to residents, such as Social Security, Medicare, and Medicaid was $1.1 billion in 2022, out of a total of $2.5 billion in personal income. By contrast, wages and salaries paid to workers in the county were only $1 billion.

Figure 6



The Census Bureau just released updated estimates of county to county commuting patterns. These reveal the historical interchange of workers to and from Pike County. We see in Table 1 that Pike County is a regional employment center, with more workers than working county residents. Local residents fill 72 percent of the 21,700 jobs in the county, with a significant flow of nonresidents commuting into work from Floyd, Mingo, Letcher, Buchanan, Knott and Johson counties.

Consider now the opposite flow in Table 2, where Pike County residents work. In this survey, there were 18,900 working Pike County residents, of which 83 percent worked in their home county. One can see that Mingo, Floyd, Letcher, Buchanan and Logan counties are the primary external destinations.

Table 1

County of Residence of Workers in Pike County, KY		
Pike	15,705	72.4%
Floyd	3,005	13.9%
Mingo, WV	933	4.3%
Letcher	492	2.3%
Buchanan, VA	304	1.4%
Knott	201	0.9%
Johnson	198	0.9%
Lawrence	136	0.6%
all other	707	3.3%
Total	21,681	100.0%

Source: US Census Bureau, American Community Survey, Residence County to Workplace County Commuting Flows, 5-Year ACS, 2016-2020

Table 2

County of Work for Residents of Pike County		
Pike	15,705	83.1%
Mingo, WV	998	5.3%
Floyd	722	3.8%
Letcher	215	1.1%
Buchanan, VA	189	1.0%
Logan	147	0.8%
Loudon, TN	108	0.6%
Laurel	86	0.5%
All other	723	3.8%
Total	18,893	100.0%

Source: US Census Bureau, American Community Survey, Residence County to Workplace County Commuting Flows, 5-Year ACS, 2016-2020

Modeling the Economic Impacts

I take a conventional approach to modeling the regional economic impacts, using a customized input-output model of Pike County[2]. I have purchased annual economic data for all 120 Kentucky counties and use these as needed to construct regional models – of a county, a group of counties, or the whole state. The model has detailed information about the linkages among 520 potential industries in each regional economy, as well as the relationship between household spending and demand for local retail goods and services due to the employee compensation or other forms of income. When there is new industrial activity in a region, the model can predict how much of the supply chain can be met by local businesses and how much the new payroll will result in additional sales (and jobs) by local businesses.

The ratio of the total regional economic activity to a change in activity by a local industry is called a multiplier. For example, if a new manufacturing company adds 100 jobs and the county were to ultimately see another 80 jobs due to related spinoff activity, the employment multiplier would be 1.8 (180 total jobs divided by 100 direct jobs). Similar

[2] For documentation of IMPLAN modeling, see www.implan.com/history/ . For this project I use economic data for 2022, the latest available.

multiplier effects are generated for business output, employee compensation, and value-added[3].

The relevant sector for the construction phase is number 52, "Construction of new power and communication structures", and I use this to model the initial investment. The employment multiplier for that sector in Pike County is 1.365. This is a very modest multiplier, due to the fact that almost all the materials used to assemble a solar farm are made outside the county; thus, there are few inter-industry impacts locally. Moreover, while the county has a more developed retail and service sector than surrounding counties, it cannot supply all the goods and services demanded by households.

There will also be some spin-off impacts from ongoing operations. Unfortunately, for the operations phase, the relevant IMPLAN sector, number 42, "Electric Power Generation – Solar", is empty of data and results for Pike County. This is because there is no history of solar electricity generation and therefore no basic economic data to construct industry relationships. However, with the recent data for 2022, for the first time I find the sector has activity in the state level model. The employment multiplier for the state of Kentucky is 2.991. I will use that below to estimate the annual spinoff impact of operations.

Construction Payroll and Local Economic Impacts

From an economic perspective, the solar project has two phases, construction and operations. The construction phase is expected to last about one and a half years, while the operations phase will last 30 to 35 years. Almost all the employment occurs in the construction phase. The regional economic impacts consist of the direct effects of spending by the developer, and any spinoff impacts due to local purchases of supplies and new spending by households as a result of the increased incomes.

Direct effects

The company's investment will include both hard and soft costs, and a mixture of spending in Kentucky and outside the state. The investment involves land acquisition, site preparation, solar panel and electrical equipment installation, plus landscaping and security fencing. Pike County Solar Project, LLC plans to enter into an Engineering,

[3] Value-added is a measure of how much economic activity actually sticks to a region. For example, if one purchases a new vehicle for $40,000 from a local dealership, only a few thousand dollars actually is captured in the county. Business revenues rise by $40,000, but most of it flows right out to the place where the vehicle was made. Local value-added measures the fraction of the sale that ends up paying workers and owners at the dealership, as well as any local taxes captured as a result of the sale.

Procurement, and Construction (EPC) contract for this project, so it is not possible to know precisely how many workers will be employed nor their total compensation. For modeling purposes, I am using an estimate of average employment over a one and a half years construction phase. The results of a recent California study of six large photovoltaic projects suggests that there will be an estimated average of 240 direct jobs over a twelve to eighteen-month construction period for this project[4].

Table 3

Construction wages and benefits from 2014 Berkeley study			
	Average annual wage	Average annual benefits	Total compensation
CA Valley & Topaz Combined, Low Wage	$52,736	$24,104	$76,840
Average Across Six Solar Projects	$78,002	$36,880	$114,882
Source: https://laborcenter.berkeley.edu/pdf/2014/building-solar-ca14.pdf			

The California study also provides a range of results for construction wages and benefits, as shown in Table 3. The lowest average annual construction wage reported was $52,736, and the average wage across the six projects was $78,002, as shown in the table above. California is, of course, a high-wage state, with a much higher cost of living than Kentucky. On the other hand, the wage results are from projects developed a decade ago, and there have been large increases in average wages across the US since then.[5]

Occupations include construction managers, earth grader operators, panel installers, electricians, and fencers. I searched the federal database on hundreds of occupations to learn how much these workers are likely to earn on the Project. There is no listing in the Kentucky data for "Solar Photovoltaic Installer", but the national average annual wage in 2022 was $50,710[6].

[4] A University of California-Berkeley study looked at six large PV projects in California, and summarized the economics. The author finds a ratio of 2.4 FTE construction jobs per MW. Applied to the Pike County project's 100 MW one gets 240 direct construction jobs. He shows the permanent operations jobs per MW, and applied to this project one gets 3.2 FTEs. See page 28 of *Economic and Environmental Benefits of Building Solar in California*, by Peter Philips, November 10, 2014, https://laborcenter.berkeley.edu/pdf/2014/building-solar-ca14.pdf

[5] By contrast, a recent union-oriented report on Ohio solar projects claims temp workers there are only making $18 to $20 per hour, implying average annual pay of around $40,000; See https://columbusfreepress.com/article/ohio-solar-panel-farms-are-booming-construction-workers-are-being-exploited-make-it-happen

[6] Source: US Bureau of Labor Statistics, Occupational Employment Survey. For national data on solar photovoltaic installer, see www.bls.gov/oes/current/oes_nat.htm#47-2231 . For Kentucky data, see www.bls.gov/oes/current/oes_ky.htm County-level data are not available.

Table 4

Kentucky Wages for Related Occupations, 2022			
Occupation (SOC code)	Employment	Hourly mean wage	Annual mean wage
Construction Managers(119021)	-	$45.07	$93,740
Operating Engineers and Other Construction Equipment Operators(472073)	6,230	$26.20	$54,490
Electricians(472111)	9,210	$26.85	$55,840
Fence Erectors(474031)	280	$18.91	$39,320
Industrial Engineers(172112)	5,500	$42.29	$87,960
Materials Engineers(172131)	330	$47.57	$98,940
Mechanical Engineers(172141)	2,730	$40.87	$85,010
Heating, Air Conditioning, and Refrigeration Mechanics and Installers(499021)	5,240	$24.43	$50,810
Electrical Power-Line Installers and Repairers(499051)	2,590	$34.63	$72,020
Telecommunications Line Installers and Repairers(499052)	1,090	$26.10	$54,290

Source: US Bureau of Labor Statistics, Occupational Employment Survey, https://data.bls.gov/oes/#/geoOcc/Multiple%20occupations%20for%20one%20geographical%20area

Good inferences about other relevant occupations can be gleaned from Table 4. The construction managers are likely to earn over $90,000, heavy equipment operators and installers over $50,000, electricians around $56,000, and fencers $39,000. The average annual wages and salaries for all such jobs in Pike County in 2022 was $47,970[7]. Based on this information, I assume the average annual pay across the construction occupations will be $50,000, excluding fringe benefits.

Multiplying the expected number of jobs times the assumed average pay per job yields a direct construction payroll of $12.0 million. The average fringe benefits, such as employer payments for health insurance, in Kentucky for the construction industry is 21 percent[8]; so, total labor compensation assumed for these jobs is $14.6 million, or $60,700 per job.

Total impacts in Pike County from construction

The construction phase will have spin-off effects in Pike County, due to materials and labor purchased locally. The economic impact of local supplies purchased is called the indirect effect, and the impact of new local household spending is called the induced effect. Adding these two effects to the direct effect yields the total effect of a

[7] Source: US Bureau of Economic Analysis (BEA), https://www.bea.gov/data/by-place-county-metro-local , Table CAINC30, average annual wages and salaries in the county.

[8] BEA provides estimates of both total compensation and total wages by industry for the state. Dividing total construction industry compensation by wages in 2022 yields 1.21.

development, as shown in Table 5 for the case of 100 construction jobs. Dividing the total effect by the direct effect yields a multiplier. Using the Pike County multipliers for the relevant construction sector, and the direct construction budget, I project there will be an estimated total of 328 new jobs in the county, and new labor compensation of an estimated $17.83 million.

Table 5

100 Jobs in Sector 52, Construction of new power and communication structures

Impact Type	Employment	Labor Income	Value Added	Output
Direct	100.0	$7,917,828	$12,682,539	$19,074,605
Indirect	12.5	$641,210	$1,238,193	$2,450,060
Induced	24.1	$1,128,088	$2,086,383	$3,642,110
Total	136.5	$9,687,127	$16,007,116	$25,166,774
implied multiplier	*1.365*	*1.223*	*1.262*	*1.319*

Source: IMPLAN model of Pike County, using 2022 economic data.

The table illustrates the various impact components across several standard economic measures. These are stated in terms of 100 direct jobs, but can be scaled up or down to fit any assumed number of construction jobs[9]. Note that both the induced effects are twice as large as the indirect effects. The indirect effect is small due to the lack of local suppliers of solar farm materials. The induced effect is bigger, due to the extensive retail and service businesses in the county to absorb the new household income linked to the construction jobs.

Wider regional impacts from construction

Some readers may wonder why I have focused on impacts in Pike County as opposed to more widespread regional impacts. Keep in mind that most federal-state statistical agencies and models measure employment on a place of work basis, as opposed to a place of residence basis. So, all construction workers at the site are counted as Pike

[9] This linear scaling is a feature of IMPLAN and other regional input-output modeling systems. It is reasonable in the case of a solar farm construction project. The feature becomes a problem in cases where an industrial development dramatically changes a local economy, for example, in the case of a large manufacturing plant in rural county. In that case, one could expect complicated and nonlinear effects, such as growth in the local population, much higher wage rates, and growth in support industries.

County jobs. Nevertheless, clearly there will be some spinoff economic activity in surrounding counties, as supplies are purchased and workers spend their paychecks at retail establishments in the region.

To investigate possible broader regional impacts, I built another IMPLAN model, this time of Pike County plus Floyd and Letcher counties. The results are the same as that of the Pike County-only simulation due to the lack of industrial development in Floyd and Letcher counties. I also performed a comparable simulation using a model covering the whole state of Kentucky. That job multiplier for the solar farm is 1.539, slightly higher than that for the three-county region. Based on our impact analysis tools, there are not significant differences in the predicted regional impacts when zooming out to adjacent counties or statewide[10]. In this case, the economic multipliers are relatively small whether one models one county, three, or 120. This is due primarily to the lack of industrial linkages in the region to the solar industry. Expanded solar and energy storage manufacturing in Kentucky, such as the Enervenue battery manufacturing facility in Shelbyville, would potentially enable the state to capitalize on a larger multiplier for renewable energy projects such as this one[11].

Impact of Ongoing Operations

The California PV study cited above found that a ratio of 31.3 MW per permanent operations job. Applied to the Pike County project, this results in an estimate of 3.2 permanent operational jobs at the site. As mentioned in the above discussion of modeling methods, the IMPLAN sector for solar farm operations is empty of data for Pike County, but economic activity is shown in the statewide model (in 2022 for the first time). The results of a simulation of 10 operations jobs is shown in Table 6. Applied to the Pike County solar project, this yields a total of an estimated 9.6 jobs. I assume, based on the California study, employee compensation per operations job to be an estimated $102,000. Applying the labor income multiplier, this yields total labor income in the county of an estimated $613,000. These impacts occur annually for the life of the project, expected to last 30 to 35 years.

[10] For other industrial developments around Kentucky it is common for our models to predict job multipliers of 3, 4, or 5, particularly for complicated manufacturing operations such as motor vehicles and parts.

[11] See https://enervenue.com/enervenue-opening-gigafactory-in-shelby-county-kentucky-to-scale-production-of-its-differentiated-energy-storage-solutions/

Table 6

10 Jobs in Sector 42, Electricity Generation - Solar				
Impact Type	**Employment**	**Labor Income**	**Value Added**	**Output**
Direct	10.0	$1,510,669	$4,363,792	$7,894,802
Indirect	10.2	$785,712	$1,905,999	$4,110,995
Induced	9.8	$529,264	$958,516	$1,707,422
Total	29.9	$2,825,646	$7,228,307	$13,713,219
implied multiplier	*2.991*	*1.870*	*1.656*	*1.737*
Source: IMPLAN model of State of Kentucky, using 2022 economic data.				

Local Tax Revenues

Pike County and the Commonwealth of Kentucky levy property taxes on real estate and tangible property, and the Commonwealth taxes the value of manufacturing machinery. The latest published tax rates that are applied county-wide are provided in Table 7. They total between one and two percent of the assessed value of real estate and tangible property. The Pike County public school system is by far the biggest recipient of property tax revenues.

Table 7

Pike County Property Tax Rates, 2023

in cents per $100 valuation

Jurisdiction	Real Estate	Tangible Personal	Manufacturers' Machinery
Extension Service	3.80	3.92	
General Fiscal Court	18.00	25.00	
Health	6.00	6.00	
Library	10.50	12.24	
Soil Conservation	0.80	0.00	
County Public Schools	86.10	86.10	
State of Kentucky	11.40	45.00	15.00
Total, County-wide	136.60	178.26	15.00

Source: Kentucky Department of Revenue
https://revenue.ky.gov/News/Publications/Pages/Property-Tax-Rate-

There are three municipalities in Pike County that levy separate property taxes – Coal Run, Elkhorn, and Pikeville. However, the solar project is outside of those cities and would not be subject to those additional taxes.

Pike County levies a county-wide occupational tax of one percent on wages, salaries and other compensation, as well as on the net profits of businesses[12]. If construction worker compensation is fully captured by the tax, the County would receive a one-time estimated increase of $178,000 in occupational tax revenues. And, if the compensation in the operations phase is fully captured, the county would receive an estimated

[12] See www.pikecountyky.gov/wp-content/uploads/2015/07/Occupational-Tax-Ordinance.pdf

additional $6,000 *annually*. I have no basis to predict the amount of net profits taxes the County might receive from the construction and operation of the solar farm.

The company may pursue an Industrial Revenue Bond (IRB) for the project through Pike County Fiscal Court. Under an IRB, the county would actually own the property for the likely 30 to 35 year life of the bond, and thus the investment is exempt from property taxes. Under the IRB the company makes the debt service payments and the County incurs no financial risk. Moreover, the company would likely make Payments in Lieu of Taxes (PILOT) each year to partially replace the tax revenues that the County would have received.

Appendix

Demographic and Economic Characteristics of Pike County		
	Pike County	**State of Kentucky**
Number of residents	*58,196*	*4,502,935*
Median age	42.5	39.1
Percent white	96.2%	84.8%
Percent of noninstitutionalized population w disability	29.0%	17.6%
Percent foreign-born	0.80%	4.10%
Percent 18 and older veteran	5.0%	7.0%
Percent living in same house as a year ago	88.9%	86.6%
High school attainment rate, population aged 25+	79.8%	88.2%
College attainment rate, population aged 25+	15.8%	26.5%
Number of Households	23,967	1,769,102
Median household income	$41,271	$60,183
Persons per household	2.43	2.55
With broadband internet subscription	79.7%	85.6%
Population 16+	*47,814*	*3,607,440*
In the labor force	43.5%	59.5%
Employed civilian	40.3%	56.1%
Unemployed	3.2%	3.0%
Armed forces	0.0%	0.4%
Not in labor force	56.5%	40.5%
Median travel time to work (minutes)	25.2	23.9
Civilian employed population 16 years and over	*19,273*	*2,025,396*
Management, business, science, and arts occupations	36.9%	36.4%
Service occupations	16.3%	15.7%
Sales and office occupations	22.6%	20.6%
Natural resources, construction, and maintenance occupations	10.6%	8.8%
Production, transportation, and material moving occupations	13.7%	18.6%
Industry		
Agriculture, forestry, fishing and hunting, and mining	4.8%	1.8%
Construction	5.7%	6.2%
Manufacturing	6.1%	14.2%
Wholesale trade	2.5%	2.3%
Retail trade	13.6%	11.8%
Transportation and warehousing, and utilities	5.7%	6.8%
Information	1.1%	1.4%
Finance and insurance, and real estate and rental and leasing	5.7%	5.6%
Professional, scientific, and mgmt, and admin and waste mgmt services	7.1%	9.0%
Educational services, and health care and social assistance	31.3%	24.0%
Arts, entertainment, and recreation, and accommodation and food services	7.7%	8.1%
Other services, except public administration	3.8%	4.5%
Public administration	4.9%	4.3%

Source: US Census Bureau, American Community Survey, 5-year profiles, 2018-22, www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/