Paul A. Coomes, Ph.D.
Consulting Economist
3604 Trail Ridge Road Louisville KY 40241 502.608.4797 coomes.economics@gmail.com
Emeritus Professor of Economics, University of Louisville

REVISED DRAFT: August 27, 2023

TO: Shane Kelley
Environmental Scientist, Stantec
9200 Shelbyville Road Suite 800
Louisville KY 40222-5136
Mobile: 502-718-9512
shane.kelley@stantec.com

FROM: Paul Coomes

RE: Estimated economic impact of Song Sparrow Solar, Ballard County, Kentucky

Executive Summary

Song Sparrow Solar LLC proposes to develop a solar facility with up to 104 MWac generating capacity on about 655 acres of private land in Ballard County KY. The company anticipates to invest approximately $157 million to develop Song Sparrow Solar (the "Project"). This memo 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 one-time increase in jobs during the construction period over approximately 14 months. Using estimates of the construction payroll, it is estimated that there will be a total (direct and spinoff) of 298 new jobs in the County in year one, with new labor compensation of $18.0 million. Ballard County levies a one percent occupational tax on wages, salaries and other compensation. Thus, assuming this construction projection materializes, Ballard County would receive about $180,000 in one-time tax revenues.

Second, the company is pursuing an Industrial Revenue Bond with the County Fiscal Court. There will be several decades of Payments in Lieu of Taxes (PILOT) to the County for the benefit of the County and, at the County's discretion, other local districts. This amounts to $104,000 per year during the first 20 years of the IRB and $52,000 per year during the final 20 years of the IRB, a total of $3.12 million in local revenue over four

decades. I estimate that the land currently generates only about $7,500 per year for the County and other local jurisdictions, compared to the average of $78,000 in PILOT payments annually by the development.

A summary of the main impacts is provided below.

Song Sparrow Solar, Ballard County	
Investment	$157,000,000
Jobs due to contruction, direct and spinoff	298
Labor income due to construction, direct and spinoff	$18,000,000
County occupational taxes, construction	$180,000
Payment in Lieu of Taxes to County/Schools, over 40 years	$3,120,000

Demographic and Economic Characteristics of Ballard County

Ballard County is located in the southwestern corner of Kentucky, south and east of the Ohio River just as it joins with the Mississippi River between Wickliffe and Paducah (Figure 1). Interstate Highway 24, to the east, connects Nashville and St. Louis.

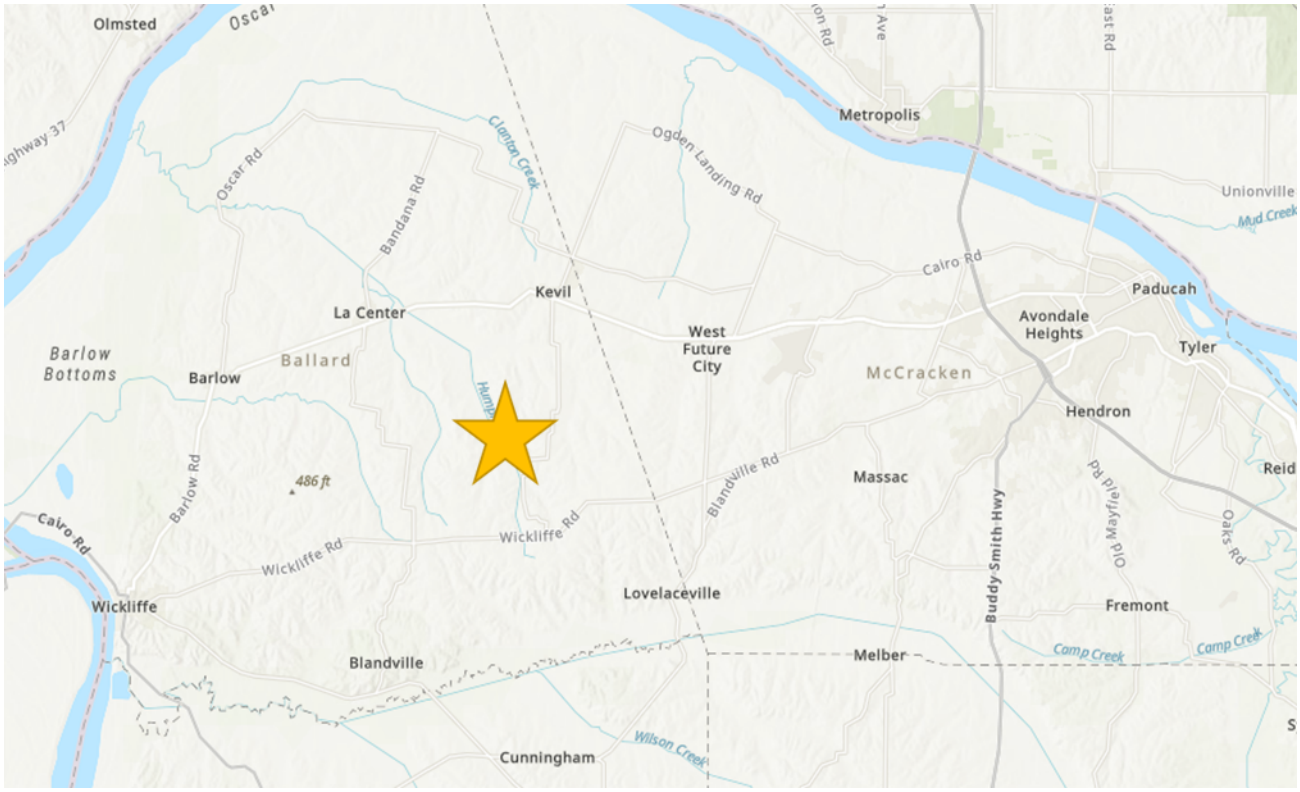
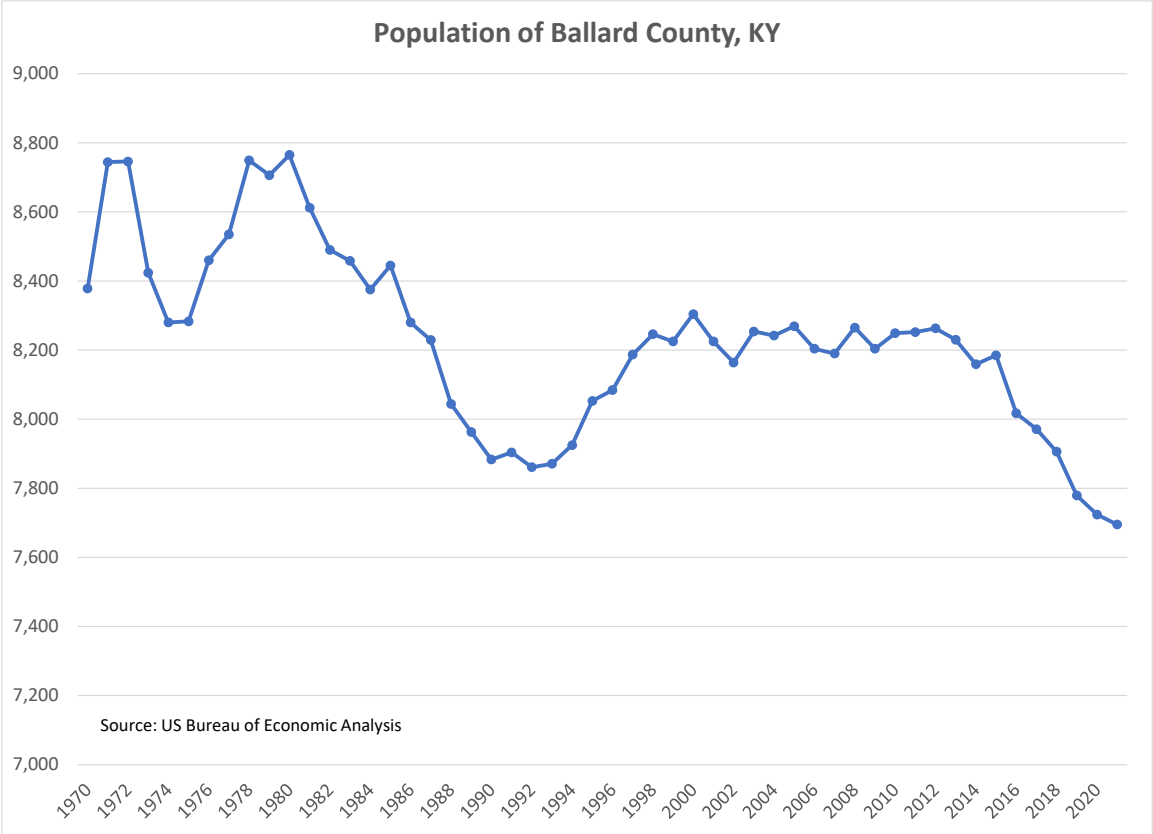


Figure 1

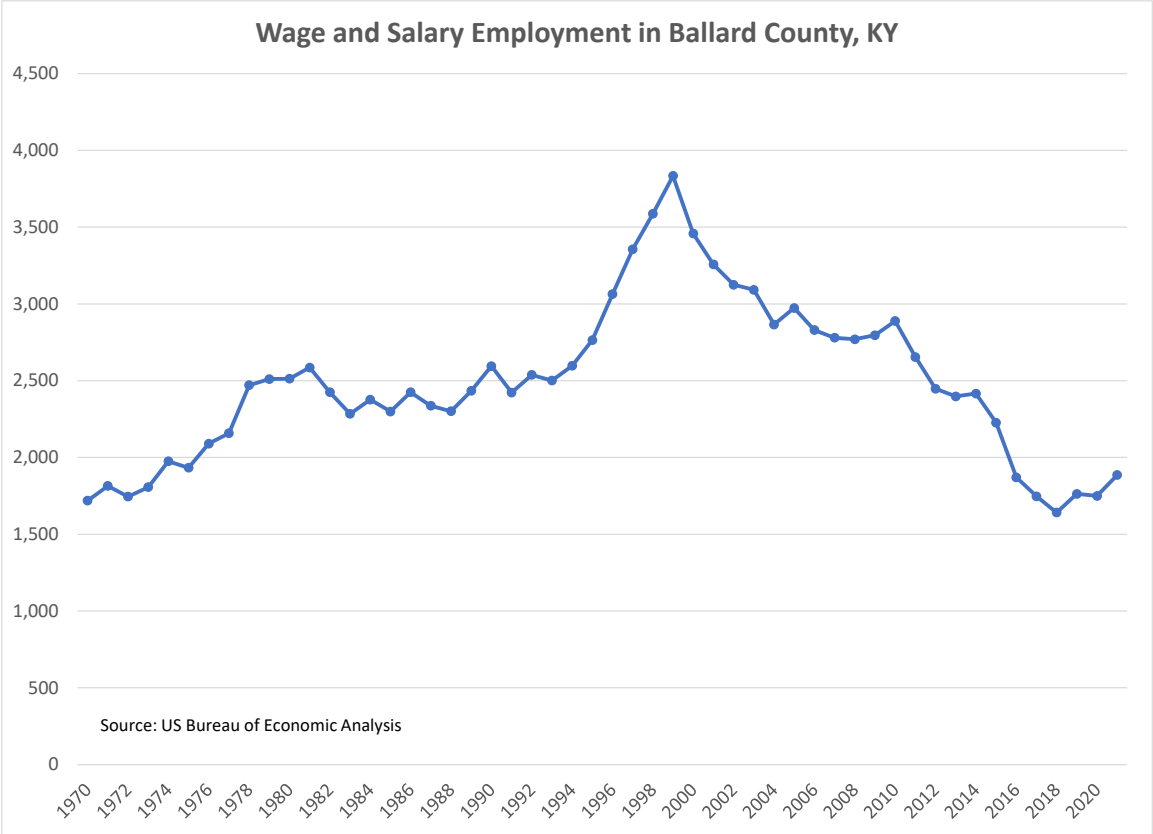
Newly released results from the 2021 American Community Survey provide a summary of economic characteristics of Ballard County. Some details are provided in a table at the end of this report. The following noteworthy items are outlined below for consideration:

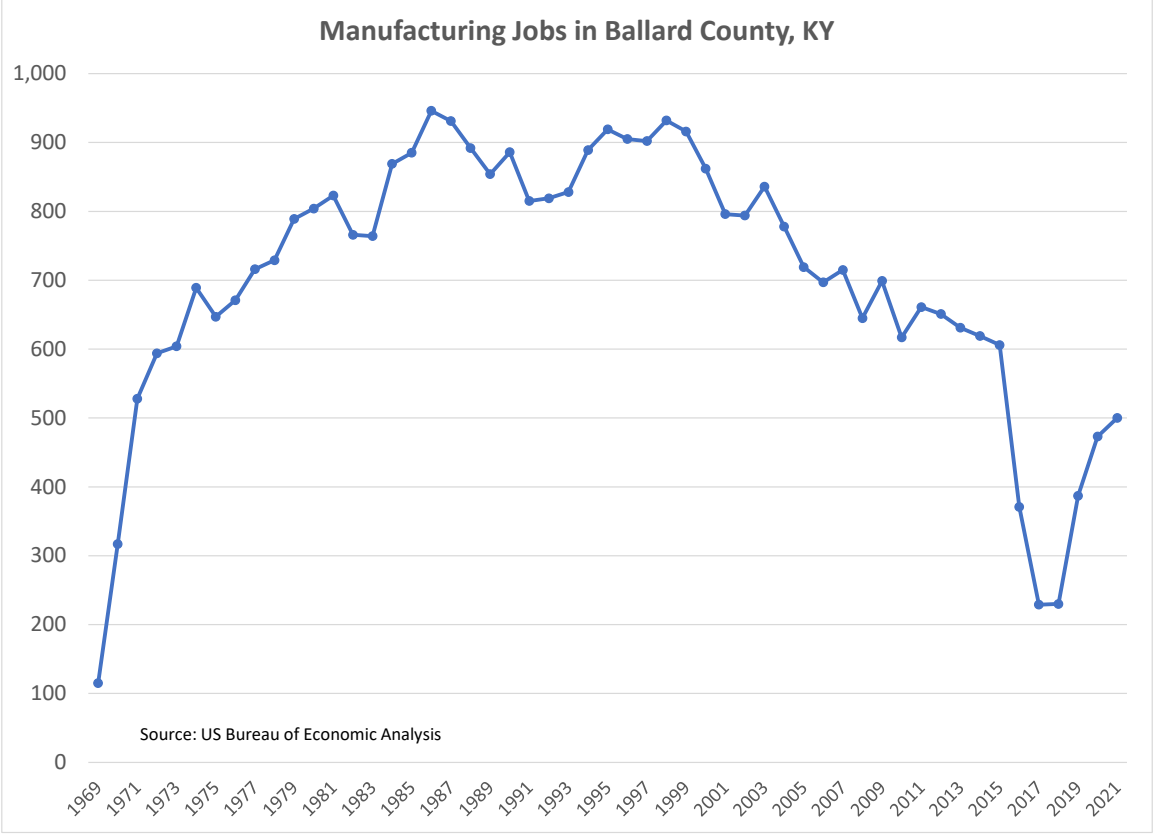
➢

- Median household income was $49,900, compared to a state average of $55,500.



Ballard County has lost on net about 8 percent of its residents over the past five decades. The number of residents in the County has hovered around 8,200 during the 2000 to 2010 decade, but then lost several hundred residents over the past fifteen years. This demographic pattern is highly correlated with the number of jobs in the County, as is evident in the next chart. Without job growth, the County tends to lose residents.


Wage and Salary Employment in Ballard County, KY
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Source: US Bureau of Economic Analysis
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020


Manufacturing Jobs in Ballard County, KY
1,000
900
800
700
600
500
400
300
200
100
0
Source: US Bureau of Economic Analysis
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

The County added about 1,000 jobs in the 1990s, but has since given up all those gains. One can see that the expansion was caused by strong growth in manufacturing jobs, which ended in the late 1990s, followed by a retraction. An examination of employment history by major industry over the last two decades shows a decline in every major industry, including manufacturing. See table below.

It appears from historical data on personal income that the County residents are increasingly dependent on income earned from commuting to McCracken County and from government transfer payments to those residents. Wages and salaries paid to workers in Ballard County peaked in 2010 at $147 million, and by 2021 were only $100 million (in nominal dollars). Meanwhile, the "residence adjustment", that is the net effect of commuters earning income among other counties, flipped from negative to positive. By 2021, $49 million of the total personal income ($392 million) of County residents was due to residents working outside of the County. In other words, County

Employment in Ballard County, Last Two Decades

	2001	2021	Growth	
Total employment (number of jobs)	4,430	2,988	-1,442	-32.6%
By type				
Wage and salary employment	3,257	1,886	-1,371	-42.1%
Proprietors employment	1,173	1,102	-71	-6.1%
Farm proprietors employment	517	350	-167	-32.3%
Nonfarm proprietors employment 2/	656	752	96	14.6%
By industry				
Farm employment	611	405	-206	-33.7%
Nonfarm employment	3,819	2,583	-1,236	-32.4%
Manufacturing	796	500	-296	-37.2%
Wholesale trade	50	59	9	18.0%
Retail trade	278	278	0	0.0%
Finance and insurance	86	75	-11	-12.8%
Real estate and rental and leasing	22	69	47	213.6%
Admin and support and waste mgmt and remediation svc	237	144	-93	-39.2%
Government and government enterprises	490	394	-96	-19.6%
Federal civilian	38	26	-12	-31.6%
Military	27	22	-5	-18.5%
State and local	425	346	-79	-18.6%
State government	59	38	-21	-35.6%
Local government	366	308	-58	-15.8%
Other industries (not disclosed)	-2508	-1951	557	-22.2%

Source: US Bureau of Economic Analysis; employment is on a place of work basis.

personal income has been driven more by residents working in other counties than from earnings from work in Ballard County.

Moreover, the share of residents' personal income from government transfer payments rose from 20 to 34 percent over the last two decades. The value of those transfer payments, such as Social Security, Medicare, and Medicaid was $134 million in 2021.

County of Residence of Workers in Ballard County, KY		
Ballard County	1,519	55.6%
McCracken County	556	20.4%
Carlisle County	202	7.4%
Graves County	113	4.1%
Alexander County	54	2.0%
Hickman County	44	1.6%
Stewart County	44	1.6%
Marshall County	38	1.4%
all other	162	5.9%
Total	2,732	100.0%

Source: US Census Bureau, American Community Survey, Residence County to Workplace County Commuting Flows, 5-Year ACS, 2011-2015; Alexader County is in Illinois, and Stewart County is in Tennessee.

Ballard County residents work. In this survey there were 3,429 working Ballard County residents, of which only 1,519 work in their home county. Where do the rest of the residents work? One can see the primary work locations in the next table. McCracken County (Paducah) clearly dominates the destinations. Paducah is by far the largest city in the region, and therefore has the most job opportunties in

Data on commuting patterns are only published with a long lag, but reveal the historical interchange of workers to and from Ballard County. While local residents fill over one-half all of the jobs in the County, a significant flow of nonresidents commute to work in Ballard County, especially from McCracken, Carlisle and Graves.

Consider now the opposite flow, where

County of Work for Residents of Ballard County		
Ballard County	1,519	44.3%
McCracken County	1,471	42.9%
Marshall County	65	1.9%
Carlisle County	61	1.8%
Pulaski County	53	1.5%
Massac County	50	1.5%
Graves County	38	1.1%
Alexander County	28	0.8%
Hickman County	24	0.7%
All other	120	3.5%
Total	3,429	225.7%

Source: US Census Bureau, American Community Survey, Residence County to Workplace County Commuting Flows, 5-Year ACS, 2011-2015; Pulaski, Massac, and Alexander counties are in Illinois.

its industries. This explains the large residence adjustment to personal income just discussed.

Modeling the Economic Impacts

A conventional approach was used to model the regional economic impacts, using a customized input-output model of Ballard County[1]. Information was derived from annual economic data for all the 120 Kentucky counties and used 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 500 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. 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 change in 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 multiplier effects are generated for business output, employee compensation, and value-added[2].

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 Ballard County is 1.193. 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.

There will also be some modest spin-off impacts from ongoing operations. The company anticipates operations to support up to five jobs. Unfortunately, for the operations phase, the relevant IMPLAN sector, number 42, "Electric Power Generation – Solar", is empty of data and results for Ballard County. This is because there is no history of solar electricity generation and therefore no basic economic data to construct industry relationships. The sector is also empty of data for the statewide model.

---

[1] For documentation of IMPLAN modeling, see www.implan.com/history/ . For this project I use economic data for 2019. While data for 2020 and 2021 are available now, they reflect abnormal pandemic conditions, and I do not believe they are representative of typical economic linkages.

[2] 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.

Construction Phase

From an economic perspective, the Project has two phases, construction and operations. The construction phase is expected to last about 14 months, while the operations phase is expected to last 40 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 their increased incomes.

Direct effects

The company expects to invest approximately $157 million in capital to develop and construct the Project. The investment involves real estate transactions, site preparation, solar panel and electrical equipment procurement and installation, and landscaping and security fencing. Song Sparrow plans to enter into an Engineering, 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, an estimate of average employment over a one-year construction phase is assumed. The results of a recent California study of six large photovoltaic projects suggests that there will be an average of 250 direct jobs over a twelve-month construction period for this project[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. 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. California is, of course, a high wage state, with a much higher cost of living than Kentucky. On the other hand,

[3] 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 Song Sparrow's 104 MW one gets 250 direct construction jobs. He shows the permanent operations jobs per MW, and applied to this project one gets 3.3 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

the wage results are from projects developed a decade ago, and there have been large increases in average wages across the US since then.[4]
Occupations include construction managers, earth grader operators, panel installers, electricians, and fencers. The federal database containing earnings for the relevant occupations to construct the Project has no listings in the Kentucky data for "Solar Photovoltaic Installer", however the national average annual wage in 2021 was $50,710[5].

Inferences about other relevant occupations can be gleaned from the accompanying table. The construction managers are likely to earn over $90,000, heavy equipment operators and installers over $50,000, electricians around $53,000, and fencers $35,000.

For this Project, it is assumed the average construction wage will be $50,000. The average annual pay for all jobs in Ballard County in 2021 was $53,241[6].

	Kentucky Wages for Related Occupations, 2021			
SOC code	Occupation	Employment	Hourly mean wage	Annual mean wage
11-9021	Construction Managers	980	$46.54	$96,800
47-2073	Operating Engineers and Other Construction Equipment Operators	5,930	$24.80	$51,580
47-2111	Electricians	9,260	$25.66	$53,370
47-4031	Fence Erectors	60	$16.77	$34,880
17-2112	Industrial Engineers	320	$41.01	$85,300
17-2131	Materials Engineers	2,370	$45.47	$94,570
17-2141	Mechanical Engineers	1,210	$39.23	$81,600
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	5,790	$24.27	$50,470
49-9051	Electrical Power-Line Installers and Repairers	2,930	$32.41	$67,410
49-9052	Telecommunications Line Installers and Repairers	1,170	$23.25	$48,350
	Source: US Bureau of Labor Statistics, Occupational Employment Survey, www.bls.gov/oes/current/oes_ky.htm			

Multiplying the number of jobs by the assumed average pay per job yields a direct construction payroll of $12.5 million. The average fringe benefits, such as employer payments for health insurance, in Kentucky for the construction industry is 21 percent[7];

[4] 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

[5] 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.

[6] 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 county.

[7] BEA provides estimates of both total compensation and total wages by industry for the state. Dividing total construction industry compensation by wages in 2021 yields 1.21.

which increases the total labor compensation for these jobs to $15.1 million, or $60,700 per job.

Total Effects in Ballard County from construction

The construction phase will have some spin-off effects in Ballard 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 development, and dividing the total effect by the direct effect yields a multiplier. Using the Ballard County multipliers for the relevant construction sector, and the direct construction budget, it is projected there will be a total of 298 new jobs in the County, and new labor compensation of $18.0 million.

The accompanying table illustrates the various impact components across several standard economic measures. It is stated in terms of 100 direct jobs, but can be scaled up to fit any assumed number of construction jobs. Note that both the indirect and induced effects are quite small. The indirect effect is small due to the lack of local suppliers with materials to support the construction of solar facilities. The induced effect is small due to the lack of retail and service businesses in the County to absorb the new household income linked to the construction jobs.

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

Impact Type	Employ-ment	Labor Income	Value Added	Output
Direct Effect	100	$4,738,516	$7,811,978	$14,012,741
Indirect Effect	10.9	$595,537	$938,925	$1,892,160
Induced Effect	8.5	$283,582	$803,652	$1,422,470
Total Effect	119.3	$5,617,636	$9,554,555	$17,327,370
implied multiplier	*1.193*	*1.186*	*1.223*	*1.237*

Source: IMPLAN model of Ballard County, using 2019 economic data.

Regional Effects from Construction

Some readers may wonder why the analysis focused on impacts in Ballard 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 Ballard 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.

To investigate possible broader regional impacts, a separate IMPLAN model was built, this time of Ballard, Carlisle, Graves and McCracken counties. McCracken (Paducah) is by far the most populous county in the region, and will no doubt supply many workers to the Project, as well as absorb a lot of the new household spending. The results are a bit larger than that of the Ballard-only simulation, primarily because of the inclusion of the more urbanized and adjacent McCracken County.

The job multipliers for the solar farm construction phase are 1.193 for Ballard alone, and 1.436 for the four-county region, for a net change of 61 total predicted jobs. (Other economic multipliers, such as labor income and business output, are also consistently in that range). A comparable simulation was also performed using a model covering the whole state of Kentucky. That job multiplier for the solar farm is 1.564, slightly higher than that for the four-county region. Based on the impact analysis tools, there are not significant differences in the predicted regional impacts when zooming out to adjacent counties or statewide[8]. In this case, the economic multipliers are relatively small whether one models one county, four, or 120. This is due to the lack of industrial linkages in the region to the solar industry.

Impact of Ongoing Operations

As mentioned in the above discussion of modeling methods, the IMPLAN sector for solar farm operations is empty of data. A reasonable recourse is to tap the literature on solar project impacts, find comparable places, and use other studies to estimate the likely operational impacts on local economies in Kentucky. The California PV study cited above found that a ratio of 31.3 MW per permanent operations job. Applied to the Ballard County project, this results in an estimate of 3.3 permanent operational jobs at the site. Thus, ongoing annual economic impacts are expected to be small relative to the one-time impacts of construction.

[8] 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.

Local Tax Revenues

Ballard 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 table below provides the latest published tax rates that are applied County-wide. They total less than one percent of the assessed value of property, with about 60 percent of the revenue going to the County public school system. There are four municipal taxing jurisdictions in Ballard County - Barlow, Kevil, La Center, and Wickliffe - but the project is outside their city boundaries and thus would not be subject to those property taxes.

Ballard County Property Tax Rates, 2022
in cents per $100 valuation

Jurisdiction	Real Estate	Tangible Personal
Ambulance	7.0000	7.0000
Extension Service	3.1000	3.2200
General Fiscal Court	22.0000	22.0000
Health	3.0000	3.0000
Soil Conservation	1.6000	0.0000
County Public Schools	55.4000	55.4000
Total, County-wide	92.1000	90.6200

Source: Kentucky Department of Revenue
https://revenue.ky.gov/News/Publications/Property%20Tax%20Rate%20Books/Property%20Tax%20Rate%20Book%202022.pdf

Ballard County also levies a one percent occupational tax on wages, salaries and "other compensation".[9] As best I can tell, the County does not levy a similar tax on net profits – as do most jurisdictions that levy an occupational tax. Thus, if the construction phase generates a payroll in the County of $18.0 million, the County Fiscal Court would receive a one-time increase in tax revenues of about $180,000.

The company is pursuing an Industrial Revenue Bond (IRB) for the project through Ballard County Fiscal Court. Under an IRB, the County actually owns the property for the likely 30-40 year life of the bond, and thus is exempt from local property taxes. Under the IRB the company makes the debt service payments and the County incurs no financial risk. Moreover, the company proposes to make Payments in Lieu of Taxes (PILOT) each year to replace the tax revenues that the County would have received.

[9] See www.discoverballardcounty.com/wp-content/uploads/2022/01/Ballard-County-Occupational-Tax-BLANK-FORM.pdf

The company has provided a property tax projection for their intended investment, an IRB analysis, and a likely PILOT payment schedule over 40 years. With the IRB and the PILOT, the County would receive $3.12 million in revenues over those four decades. This amounts to an average of $78,000 per year.

The company also provided the parcel numbers of the land for the site, and recent property tax assessments were reviewed through the Ballard County Property Valuation Assessor's (PVA) offices[10]. There are nineteen parcels, covering 1,535 acres, which approximately 900 acres currently are planned to be leased for the project site and approximately 655 acres included within the constructed site footprint. The PVA data show that the portions of the farmland to be used for the project to have an estimated value for tax purposed of $811,035. Using current tax rates on real estate in Ballard County, these parcels would generate $7,500 in property tax receipts for local jurisdictions in 2022. This can be compared to an average of $78,000 per year the County would receive from the PILOT. It should be pointed out that solar projects like this require almost no public services from local government; and because they require so few people to operate do not add students and expenses to the County public school system.

[10] The parcel valuations are available through a commercial site, for a fee, at www.qpublic.net/ky/ballard/

Demographic and Economic Characteristics of Ballard County		
	Ballard County	**Kentucky**
Number of residents	*7,814*	*4,494,141*
Median age	44.1	39.0
Percent white	92.7%	85.5%
Percent of noninstitutionalized population w disability	17.2%	17.4%
Percent foreign-born	1.10%	4.00%
Percent 18 and older veteran	8.3%	7.2%
Percent living in same house as a year ago	93.3%	86.0%
High school attainment rate, population aged 25+	89.2%	87.7%
College attainment rate, population aged 25+	16.1%	25.7%
Number of Households	2,945	1,748,475
Median household income	$49,919	$55,454
Persons per household	2.65	2.57
With broadband internet subscription	83.9%	83.6%
Population 16+	*6,410*	*3,588,209*
In the labor force	53.6%	59.5%
Employed civilian	50.6%	56.0%
Unemployed	2.9%	3.1%
Armed forces	0.1%	0.4%
Not in labor force	46.4%	40.5%
Median travel time to work (minutes)	22.0	23.7
Civilian employed population 16 years and over	*3,242*	*2,009,185*
Management, business, science, and arts occupations	29.3%	35.7%
Service occupations	14.4%	15.8%
Sales and office occupations	24.4%	21.0%
Natural resources, construction, and maintenance occupations	14.3%	8.9%
Production, transportation, and material moving occupations	17.6%	18.5%
Agriculture, forestry, fishing and hunting, and mining	2.6%	1.9%
Construction	11.7%	6.1%
Manufacturing	10.4%	14.3%
Wholesale trade	2.2%	2.4%
Retail trade	12.0%	11.9%
Transportation and warehousing, and utilities	11.2%	6.6%
Information	0.4%	1.4%
Finance and insurance, and real estate and rental and leasing	3.5%	5.6%
Professional, scientific, and mgmt, and admin and waste mgmt services	9.2%	8.7%
Educational services, and health care and social assistance	21.8%	24.1%
Arts, entertainment, and recreation, and accommodation and food	6.5%	8.3%
Other services, except public administration	5.6%	4.5%
Public administration	3.1%	4.3%

Source: US Census Bureau, American Community Survey, 5-year profiles, 2017-21, www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/