The Economic and Fiscal Benefits of Rural Utility-Scale Renewable Energy Facilities in Nevada

September 2018

Prepared for: The Western Way

Prepared By:

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Patricia Silverstein, President & Chief Economist

David Hansen, Senior Economist

10184 West Belleview Avenue, Suite 100

Littleton, Colorado 80127

www.DevelopmentResearch.net

303.991.0070

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SUMMARY

Economic and Fiscal Benefits of Rural Renewable Energy Facilities in Nevada

- From 2006 to 2017, the total direct and indirect benefits of rural renewable energy construction activity in Nevada was an estimated $7.9 billion in total output ($4.3 billion direct output + $3.6 billion indirect and induced output) produced by 12,056 employees (6,736 direct employees + 5,320 indirect employees) earning a total of about $947.3 million ($624.2 million direct earnings + $323.1 million indirect earnings).

  The benefits included a direct fiscal benefit to Nevada of an estimated $152.3 million. This was comprised of an estimated $29.5 million for the state and $122.8 million for local communities and school districts.

- In 2018, the total direct and indirect benefits of annual rural renewable energy operations in Nevada will be an estimated $187.5 million in total output ($128.4 million direct output + $59.1 million indirect and induced output) produced by 1,144 employees (357 direct employees + 787 indirect employees) earning a total of about $61.3 million ($31.2 million direct earnings + $30.1 million indirect earnings).

  The benefits will include a direct fiscal benefit to Nevada of an estimated $6.3 million. This is comprised of an estimated $3.5 million for the state and $2.8 million for local communities and school districts.

Case Study of the Potential Economic and Fiscal Benefits of a new 75 MW-Geothermal Energy Facility in Lyon County

- The total direct and indirect benefits of construction activity associated with a new 75 MW-geothermal energy facility in Lyon County could be an estimated $14.9 million in total output ($10.9 million direct output + $4 million indirect and induced output) produced by 26 employees (18 direct employees + 8 indirect employees) earning a total of about $2.3 million ($1.8 million direct earnings + $505,000 indirect earnings) during the construction period.

- The total direct and indirect benefits of annual operations for a new 75 MW-geothermal energy facility in Lyon County could be an estimated $8.9 million in total output ($7.4 million direct output + $1.5 million indirect and induced output) produced by 42 employees (21 direct employees + 21 indirect employees) earning a total of about $3.1 million ($2.4 million direct earnings + $715,000 indirect earnings).

  The benefits will include an annual direct fiscal benefit to Lyon County of an estimated $323,100.

Case Study of the Potential Economic and Fiscal Benefits of a new 100 MW-Solar Photovoltaic Energy Facility in Nye County

- The total direct and indirect benefits of construction activity associated with a 100 MW-solar PV energy facility in Nye County could be an estimated $2.5 million in total output ($2 million direct output + $492,000 indirect and induced output) produced by 9 employees (7 direct employees + 2 indirect employees) earning a total of about $825,000 ($717,000 direct earnings + $108,000 indirect earnings) during the construction period.

- The total direct and indirect benefits of annual operations for a new 100 MW-solar PV energy facility in Nye County could be an estimated $1.9 million in total output ($1.6 million direct output + $316,000 indirect and induced output) produced by 17 employees (9 direct employees + 8 indirect employees) earning a total of about $893,000 ($675,000 direct earnings + $218,000 indirect earnings).

  The benefits will include an annual direct fiscal benefit to Nye County of an estimated $490,800.

INTRODUCTION

Renewable energy generation facilities are important to the economic base of communities across Nevada, many of which are located in rural areas of the state. Renewable energy capacity has grown rapidly in Nevada, particularly from non-hydroelectric renewable sources such as solar, geothermal, and wind. Since 2000, net electricity generation from non-hydroelectric sources in the state increased from 3.9 percent of total net generation to 17.3 percent in 2016.[1] A renewable portfolio standard, targeting 25 percent renewable energy in the state by 2025, tax incentives, and other state policies have boosted renewable energy investment in the state. Additionally, the rapidly falling cost of renewable energy technologies has also enhanced their economic viability. For instance, the average unsubsidized levelized cost of utility-scale crystalline solar photovoltaic facilities in the United States has decreased about 86 percent since 2009.[2] The intent of this study is to estimate the economic and fiscal benefits to Nevada of the construction and operations of utility-scale[3] solar, geothermal, and wind generation facilities that are located in rural areas of the state. In addition to a statewide analysis, this study includes two case studies estimating the potential benefits a renewable facility could have in rural counties, demonstrating the potential benefits that can be realized in similar communities throughout the state.

ECONOMIC AND FISCAL IMPACT ANALYSIS DEFINED

Economic impact analysis is the analytical approach used to assess measurable direct and indirect benefits resulting from a project over a specific time period. Only those benefits that can be measured or quantified are included. Intangible benefits, such as enhancement of community character or diversification of the job base, are not included. The economic benefits are calculated within the framework of two categories of impacts and activities, which are construction and on-going operations.

Further, the economic impact is divided into direct and indirect impacts. The direct impacts include the direct spending for construction of a renewable facility and the direct spending for the on-going operations of the facility, including employee spending. The impact of constructing utility-scale renewable energy facilities has large but temporary impacts on the affected communities during the construction period. The construction impacts include the purchase of construction materials, construction worker earnings and resulting expenditures, and the tax implications of these purchases. The impact of on-going operations and maintenance of utility-scale renewable energy facilities has an annual impact on the affected communities over the life of the project. The on-going operations impacts include annual purchases of operational materials, replacement capital purchases, land-owner payments, employment and earnings, and the tax implications of these annual expenditures. The direct economic benefits of the facilities were estimated using the Jobs and Economic Development Impacts (JEDI) models developed by the National Renewable Energy Laboratory (NREL).

The economic impact does not stop with the direct impacts as the spending patterns associated with the renewable energy facility and its employees has multiplicative impacts on the region. Therefore, multiplier analysis is used to trace the impacts on businesses, organizations, and individuals affected by the facility as this impact works its way through the economy. The indirect and induced jobs and income flows generated are estimated using the RIMS (Regional Input-Output Modeling System) II multipliers developed by the Bureau of Economic

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[1] Energy Information Administration, State Energy Data System.

[2] Unsubsidized levelized cost of energy quantifies the net present value of the cost of a facility over its lifetime including initial capital investment and on-going operations. Reference Lazard's Levelized Cost of Energy Analysis – Version 11.0. https://www.lazard.com/media/450337/lazard-levelized-cost-of-energy-version-110.pdf.

[3] According to the Office of Energy Efficiency & Renewable Energy in the U.S. Department of Energy, and for the purposes of this study, utility-scale renewable energy projects are defined as those 10 megawatts or larger. Utility-scale projects are generally associated with regulated electric utilities and independent power producers whose primary industry is electric power generation, transmission, and distribution.

Analysis of the U.S. Department of Commerce. This is the standard methodology for conducting multiplier analysis. The total economic benefits will be discussed in terms of the direct and indirect values of gross output, payroll or earnings, and employment in the specified region.

Fiscal impact analysis is used to assess the direct public revenues and public costs resulting from a project over a specific time period. A project may generate a broad array of public revenues ranging from sales/use tax, property tax, franchise fees, licenses and permits, and other charges for services. In turn, the local government provides a variety of public services such as police protection, public works, community social and recreational programs, and community development services, to name a few. This report includes a limited fiscal impact analysis, including estimates of direct sales/use tax revenue and property tax revenue generated only.

Development Research Partners utilized several sources of data for this study including company announcements, the State of Nevada, Lazard, the National Renewable Energy Laboratory, the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, and the Energy Information Administration. Development Research Partners made every attempt to collect the necessary information and believe the information used in this report is from sources deemed reliable but is not guaranteed.

Some numbers in the study may not add exactly due to rounding, this analysis estimates the economic and fiscal benefits in nominal dollars.

CONSTRUCTION AND INVESTMENT ACTIVITY, 2006-2017

Since 2006, there have been 29 utility-scale geothermal, solar, or wind energy facilities with a total nameplate capacity of 2,223.5 megawatts (MW) installed in rural areas[4] of Nevada. The majority of the installed capacity, nearly 66 percent in 13 projects, is located in rural areas of Clark County. Nevada is a prime location for solar energy with 1,654 MW of installed capacity in 16 projects in either photovoltaic or solar thermal facilities. Geothermal represents the second largest amount of installed capacity with 419.5 MW in 12 facilities. Most of the existing renewable facilities in rural areas of Nevada were built after 2011. Indeed, 76 percent of the existing facilities and 91 percent of nameplate capacity was built from 2012 to 2017. Only one of rural Nevada's existing facilities was built prior to 2006, the Beowawe geothermal plant that has been operating since 1985.[5]

Table 1: Rural Nevada Renewable Energy Facilities

Plant Name	County	Technology	Operating Year	Nameplate Capacity (MW)
ENEL Salt Wells LLC	Churchill	Geothermal	2009	23.6
Patua Acquisition Project, LLC	Churchill	Geothermal	2013	58.6
Tungsten Mountain	Churchill	Geothermal	2017	37.0
Boulder Solar II, LLC	Clark	Solar Photovoltaic	2017	50.0
Boulder Solar Power, LLC	Clark	Solar Photovoltaic	2016	100.0
CM10	Clark	Solar Photovoltaic	2008	10.0
CM48	Clark	Solar Photovoltaic	2010	48.0
Copper Mountain Solar 2	Clark	Solar Photovoltaic	2012 & 2015	154.0
Copper Mountain Solar 3	Clark	Solar Photovoltaic	2014-2015	255.0
Copper Mountain Solar 4	Clark	Solar Photovoltaic	2016	93.6
Moapa Southern Paiute	Clark	Solar Photovoltaic	2016	250.0
Playa Solar	Clark	Solar Photovoltaic	2017	79.0
Playa Solar 2	Clark	Solar Photovoltaic	2017	100.0
Searchlight Solar	Clark	Solar Photovoltaic	2014	17.5
Silver State Solar Power North	Clark	Solar Photovoltaic	2012	52.0
Silver State Solar Power South	Clark	Solar Photovoltaic	2015-2016	250.0
Tuscarora Geothermal Power Plant	Elko	Geothermal	2012	24.0
NGP Blue Mountain I LLC	Humboldt	Geothermal	2009	63.9
Beowawe Power	Lander	Geothermal	2011	3.6
McGinness Hills	Lander	Geothermal	2012 & 2015	100.0
Desert Peak Power Plant	Lyon	Geothermal	2006	26.0
Ft. Churchill PV	Lyon	Solar Photovoltaic	2015	19.9
Don A Campbell 1 Geothermal	Mineral	Geothermal	2014	22.5
Don A Campbell 2 Geothermal	Mineral	Geothermal	2015	25.0
Luning Energy	Mineral	Solar Photovoltaic	2017	50.0
Crescent Dunes Solar Energy	Nye	Solar Thermal	2015	125.0
Jersey Valley Geothermal Power Plant	Pershing	Geothermal	2010	23.5
San Emidio	Washoe	Geothermal	2012	11.8
Spring Valley Wind Project	White Pine	Wind	2012	150.0
Total				2,223.5

Source: U.S. Department of Energy, Energy Information Administration.

[4] The rural facilities in this analysis were identified with input from The Western Way and do not necessarily align with rural areas as defined by population or other factors.

[5] Due to the difficulty of estimating geothermal costs in 1985, the economic benefits of the primary Beowawe facility are excluded from this analysis. However, the analysis includes the benefits of an expansion of the plant's capacity in 2011.

The renewable energy development in rural Nevada brought significant investment to the state. From 2006 to 2017, there has been an estimated $7.2 billion in construction and investment in renewable energy facilities in rural Nevada. Construction and investment activities benefit the state of Nevada as developers and contractors hire labor, purchase construction materials and equipment, and invest in infrastructure.

Table 2: Rural Renewable Energy Facility Construction Activity in Nevada, 2006 to 2017

Construction Activity ($ in millions)	
Major Equipment	$2,741.8
Construction Materials	$1,335.8
Design, Engineering, Planning, Other Costs	$2,311.6
Wages and Salaries	$588.8
Employee Benefits	$252.3
Total	**$7,230.3**
Construction Employees (FTE)	7,334

Direct Economic and Fiscal Benefits

- A large amount of the costs associated with renewable energy facilities is for energy generating equipment such as solar modules, heat collection elements and exchangers, turbines, and generators. Based on estimates derived from NREL's JEDI models, and adjusting for cost reductions when necessary, an estimated $2.7 billion was spent on purchases of major generating equipment (Table 2). While most of the equipment was manufactured by companies located outside of the state, Nevada benefited from a portion these purchases. The direct economic benefit in Nevada from purchases of major generating equipment in the state for rural renewable energy facilities was an estimated $310.1 million from 2006 to 2017 (Table 3).
- Although many purchases of renewable energy generating equipment are made out-of-state, the state has benefited from a large percentage of the construction materials purchases, design, project management, planning, and other costs. Many materials for site preparation and construction are purchased locally. Based on state spending estimates in the JEDI models, the direct economic benefit to Nevada from 2006 to 2017 for purchases of construction materials, design, engineering, planning, and other costs was $3.2 billion (Table 3).
- An estimated 7,334 full-time equivalent construction workers,[6] earning $841.1 million in wages and employee benefits were employed at the 29 renewable energy facilities constructed from 2006 to 2017, or an average of about 610 workers per year (Table 2). Many of the utility scale projects have also benefited from renewable energy tax abatement incentives that are offered by the state. In order to qualify for the benefits, at least 50 percent of the employees working on construction of the facility must be residents of Nevada. In addition, the construction workers must earn an average hourly wage that is at least 175 percent of the average statewide. These requirements have boosted employment and wages in the state. Based on estimates of local labor from the JEDI models and adjusting wages based on abatement awards and state wage levels, the direct economic

[6] A full-time equivalent worker is defined as one person working full time for one year.

benefit to Nevada for rural renewable energy projects was an estimated $624.2 million in earnings[7] for 6,736 workers (Table 3).

- Purchases of equipment and materials for constructing renewable energy facilities generate sales and use tax that benefits state and local governments. The minimum statewide sales and use tax rate in Nevada is 6.85 percent, comprised of 2 percent for the state general fund, 2.6 percent distributed to communities across the state for local school support, and 2.25 percent for basic and supplemental city-county relief tax. For qualifying renewable energy projects, companies can receive a partial tax abatement incentive. The abatement includes the state general fund portion of the sales and use tax, as well as the city-county relief tax. Companies are still required to pay the local school support portion of the tax. Based on estimated purchases for the facilities, the state sales and use tax rates, and an adjustment for projects that received a tax abatement, the direct fiscal benefit to Nevada for rural renewable energy projects was an estimated $152.3 million from 2006 to 2017. This was comprised of an estimated $29.5 million for the state and $122.8 million for local communities and school districts (Table 3).
- In total, the direct economic and fiscal benefits of construction and investment in rural renewable energy projects in Nevada from 2006 to 2017 was an estimated $4.3 billion (Table 3).

Table 3: Direct Economic and Fiscal Benefits of Rural Renewable Energy Facility Investments in Nevada, 2006 to 2017

	Estimated Nevada
Direct Economic Benefits ($ in millions)	
Major Equipment	$310.1
Construction Materials	$1,211.5
Design, Engineering, Planning, Other Costs	$1,967.3
Wages and Salaries	$540.8
Employee Benefits*	$83.4
Total Construction Benefits	**$4,113.1**
Construction Employees (FTE)	6,736
Direct Fiscal Benefits ($ in millions)	
Sales and Use Tax	
State General Fund	$29.5
Local School Support	$106.0
City-County Relief	$16.8
Total	**$152.3**
Total Economic and Fiscal Benefits	**$4,265.4**

**Direct benefit estimated for Nevada includes adjustment for the percent of employee benefits likely spent locally.*

[7] Earnings represent employee compensation that directly benefits the local economy including wages and salaries and a portion of employee benefits. This includes items such as paid leave, supplemental pay, and a portion of insurance benefits. Employee benefits excluded from the direct benefit are Social Security, Medicare, unemployment insurance, and retirement, among other things.

Direct, Indirect, and Induced Economic Benefits

- Based on the industry relationships revealed through the RIMS II multipliers for the construction industry in Nevada, $4.3 billion of direct construction spending in the state supported an estimated $3.6 billion in additional output in all industries throughout Nevada. This includes the value of the local spending by the construction workers (the induced impact) and of the local supplier companies and their employees (the indirect impact) (Table 4).
- The production of the $3.6 billion in additional output in all industries throughout Nevada required an estimated 5,320 workers, referred to as the indirect workers. These workers had estimated earnings of about $323.1 million (the indirect earnings) (Table 4).
- Therefore, the total direct and indirect benefits of the rural renewable energy construction activity in Nevada was an estimated $7.9 billion in total output ($4.3 billion direct output + $3.6 billion indirect and induced output) produced by 12,056 employees (6,736 direct employees + 5,320 indirect employees) earning a total of about $947.3 million ($624.2 million direct earnings + $323.1 million indirect earnings) from 2006 to 2017 (Table 4).
- Construction benefits are temporary, occurring only during construction. The analysis does not indicate whether the direct and indirect employees were residents of Nevada or whether they were nonresidents that commuted into the state.

Table 4: Total Economic Benefit of Rural Renewable Energy Facility Investment in Nevada, 2006 to 2017

	Direct Impact	Multiplier	Indirect & Induced Impact	Total Impact
Construction Activity				
Value of Output ($M)	$4,265.5	1.8408	$3,586.3	$7,851.8
Earnings ($M)	$624.2	1.5176	$323.1	$947.3
Employment	6,736	1.7897	5,320	12,056

Source: Development Research Partners, based on multipliers for Nevada from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), 2007 U.S. Benchmark I-O Data and 2016 Regional Data.

Calculation Note: Direct x Multiplier = Total Impact

Total Impact - Direct Impact = Indirect & Induced Impact

Numbers may not add exactly due to rounding.

ANNUAL OPERATIONS, 2018

The economic and fiscal benefits of the renewable energy operations are derived from sales of energy, which in turn funds business purchases such as equipment, parts, operational materials, leases, taxes, and labor. Several of the renewable energy projects in rural areas of the state transmit and sell energy outside of the state. For example, the Copper Mountain solar projects in Clark County, with a combined 560.6 MW of installed capacity, transmit electricity to California. These projects support local jobs and taxes with dollars coming from outside of Nevada. The on-going annual operations of renewable energy facilities in rural Nevada benefit the state through employment, maintenance purchases, and other operating costs.

Direct Economic and Fiscal Benefits

- Based on estimates derived from the JEDI models and current levelized costs, annual purchases of materials and equipment for the state's rural renewable energy facilities will be an estimated $59 million in 2018. Materials and equipment purchases generate sales and use tax revenue for the state (Table 5).
- Many renewable energy projects lease land from governments and private landowners. The vast majority of the land utilized by the state's geothermal facilities and several of the state's solar facilities is leased from the U.S. Bureau of Land Management. In addition, at least one local governmental entity in Nevada has leased land for large solar facilities, boosting its revenue base. Based on estimates from the JEDI models, company announcements, and public data, annual landowner lease payments will be an estimated $22.3 million in 2018 for the state's rural renewable energy facilities (Table 5).
- Other costs associated with operations and maintenance of the state's rural renewable energy facilities will be an estimated $2.2 million in 2018 (Table 5).

Table 5: Direct Economic and Fiscal Benefits of Annual Operations of Rural Renewable Energy Facilities in Nevada, 2018

	Estimated Nevada
Direct Economic Benefits ($ in millions)	
Materials and Equipment	$59.0
Landowner Payments	$22.3
Other Costs	$2.2
Wages and Salaries	$27.0
Employee Benefits	$11.6
Total Operations Benefits	**$122.1**
Employees (FTE)	357
Direct Fiscal Benefits ($ in millions)	
Property Tax	$2.3
Sales and Use Tax	
State General Fund	$1.2
Local School Support	$1.5
City-County Relief	$1.3
Total	$4.0
Total Fiscal Benefits	**$6.3**
Total Economic and Fiscal Benefits	**$128.4**

- Renewable energy facilities provide on-going employment in Nevada. In 2018, an estimated 357 full-time equivalent employees will be employed at Nevada's rural renewable energy facilities. Compensation for these employees will be an estimated $38.6 million in wages and employee benefits, with an average wage well above the average wage statewide. It should be noted that for projects to qualify for renewable energy tax abatements, the company must pay its employees an average hourly wage at least 110 percent of the statewide hourly wage. Compensation includes wages and salaries, employee benefits that contribute to worker earnings such as supplemental pay, and employee benefits that have minimal local impact such as retirement contributions (Table 5).
- Renewable energy facilities generate property tax revenue for the state. For qualifying renewable energy projects, companies can receive a partial tax abatement incentive, equal to 55 percent of the taxes on real and

personal property each year. Based on the value of the state's rural renewable energy facilities, the state debt service tax rate of $0.17 per $100 of assessed valuation, and projects that received the tax abatement, the state will benefit from $2.3 million in property tax revenue in 2018 (Table 5).

- Purchases of equipment and materials generate sales and use tax that benefits state and local governments. Based on estimated purchases for the facilities, the direct fiscal benefit to Nevada for rural renewable energy projects will be an estimated $4 million in 2018. This will be comprised of an estimated $1.2 million for the state and $2.8 million for local communities and school districts (Table 5).
- The renewable energy facilities will also generate modified business tax (MBT) and commerce tax revenue for the state. These taxes depend on revenues for each facility, the value of which is not estimated in this analysis. MBT and commerce tax revenue generated from the facilities will increase the estimated fiscal benefits beyond those reported in Table 5.
- In total, the direct economic and fiscal benefits of annual operations for rural renewable energy projects in Nevada in 2018 will be an estimated $128.4 million (Table 5).

Direct, Indirect, and Induced Economic Benefits

- Based on the industry relationships revealed through the RIMS II multipliers for industries impacted by the business spending in Nevada, $128.4 million of direct output will likely support an estimated $59.1 million in additional output in all industries throughout Nevada in 2018. This includes the value of the local spending by the employees (the induced impact) and of the local supplier companies and their employees (the indirect impact) (Table 6).
- The production of the $59.1 million in additional output in all industries throughout Nevada will require an estimated 787 workers, referred to as the indirect workers. These workers will have estimated earnings of about $30.1 million (the indirect earnings) (Table 6).
- Therefore, the total direct and indirect benefits of annual rural renewable energy operations in Nevada is an estimated $187.5 million in total output ($128.4 million direct output + $59.1 million indirect and induced output) produced by 1,144 employees (357 direct employees + 787 indirect employees) earning a total of about $61.3 million ($31.2 million direct earnings + $30.1 million indirect earnings) in 2018 (Table 6).
- These benefits are likely to occur annually assuming similar business conditions and project parameters.

Table 6: Total Economic Benefit of Annual Operations of Rural Renewable Energy Facilities in Nevada, 2018

	Direct Impact	Multiplier	Indirect & Induced Impact	Total Impact
Operations and Maintenance				
Value of Output ($M)	$128.4	1.4607	$59.1	$187.5
Earnings ($M)*	$31.2	1.9672	$30.1	$61.3
Employment	357	3.2056	787	1,144

**Direct earnings estimate includes adjustment for the percent of employee benefits likely spent locally.*
Source: Development Research Partners, based on multipliers for Nevada from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), 2007 U.S. Benchmark I-O Data and 2016 Regional Data.
Calculation Note: Direct x Multiplier = Total Impact
Total Impact - Direct Impact = Indirect & Induced Impact
Numbers may not add exactly due to rounding.

CASE STUDY: POTENTIAL BENEFITS OF NEW GEOTHERMAL

Many renewable energy facilities are located in rural communities where solar, geothermal, and wind resources are plentiful. Lyon County has two existing utility-scale renewable facilities in operation. The first is the 26 MW Desert Peak geothermal power plant, built in 2006, and the second is the 19.9 MW Ft. Churchill solar PV power plant, built in 2015. A significant portion of the investment associated with construction of new renewable energy facilities can benefit local workers and businesses. This case study estimates the potential benefits that could be realized if a 75 MW-geothermal project were developed in Lyon County. Communities and areas with similar industries, workforces, and tax structures could realize similar benefits from the development of a new geothermal facility. A new 75 MW-geothermal project could cost an estimated $225 million, based on a cost of $3,000 per KW of installed capacity. Reported costs for some of Nevada's existing geothermal plants has ranged from about $2,800 per KW of installed capacity to $5,100. Costs can vary widely for geothermal based on the resource being utilized.

Table 7: Potential 75 MW-Geothermal Energy Facility Construction Activity in Lyon County

Construction Activity ($ in millions)	
Major Equipment	$110.1
Construction Materials	$46.7
Design, Engineering, Planning, Other Costs	$37.5
Wages and Salaries	$21.5
Employee Benefits	$9.2
Total	**$225.0**
Construction Employees (FTE)	256

CONSTRUCTION AND INVESTMENT ACTIVITY

Direct Economic and Fiscal Benefits

- Based on estimates derived from NREL's JEDI model, an estimated $110.1 million could be spent on purchases of major generating equipment such as turbines and generators, condensers, pumps, and heat exchangers (Table 7). These purchases are expected to occur outside of the county, with no direct economic benefit for county-based businesses (Table 8).
- While the purchases of the plant equipment will likely be outside the county, the county could benefit from construction materials purchases such as cement, fuel, and water. The county could capture a portion of the design, project management, planning, and other costs. Based on the concentration of establishments, employees, and sales in Lyon County and estimated purchases captured in the state from the JEDI model, the direct economic benefit of local purchases of construction materials, design, engineering, planning, and other costs could be an estimated $9.2 million (Table 8).
- An estimated 256 FTE construction workers earning $30.7 million in wages and employee benefits could be employed during the development of a potential geothermal facility (Table 7). Based on estimates of local labor and adjusting wages based on abatement awards and state wage levels, the direct economic benefit to Lyon County could be an estimated $1.8 million in earnings for 18 local workers (Table 8).
- Purchases of equipment and materials for constructing a geothermal facility could generate sales and use tax revenue for local schools. While the county could benefit from a portion of the local school support tax revenue, the distribution of the tax has not been estimated for this analysis. This analysis assumes that the

project would qualify for the state's renewable energy tax abatements that would include an abatement from Lyon County's optional taxes.[8]

- In total, the direct economic benefit to Lyon County of construction and investment associated with a 75 MW-geothermal energy facility could be an estimated $10.9 million (Table 8).

Table 8: Direct Economic Benefits of 75 MW - Geothermal Energy Facility Investment in Lyon County

	Estimated Lyon County
Direct Economic Benefits	
Major Equipment	$0
Construction Materials	$4,441,000
Design, Engineering, Planning, Other Costs	$4,717,600
Wages and Salaries	$1,521,200
Employee Benefits*	$234,700
Total Construction Benefits	**$10,914,500**
Construction Employees (FTE)	18

**Direct benefit estimated for Lyon County includes adjustment for the percent of employee benefits likely spent locally.*

Direct, Indirect, and Induced Economic Benefits

- Based on the industry relationships revealed through the RIMS II multipliers for the construction industry in Lyon County, $10.9 million of direct construction spending in Lyon County will likely support an estimated $4 million in additional output in all industries throughout the county. This includes the value of the local spending by the construction workers (the induced impact) and of the local supplier companies and their employees (the indirect impact) (Table 9).
- The production of the $4 million in additional output in all industries throughout Lyon County will require an estimated 8 workers, referred to as the indirect workers. These workers will have estimated earnings of about $505,000 (the indirect earnings) (Table 9).

Table 9: Total Economic Benefit of 75 MW-Geothermal Energy Facility Investment in Lyon County

	Direct Impact	Multiplier	Indirect & Induced Impact	Total Impact
Construction Activity				
Value of Output ($M)	$10.9	1.3669	$4.0	$14.9
Earnings ($M)	$1.8	1.2875	$0.5	$2.3
Employment	18	1.4438	8	26

Source: Development Research Partners, based on multipliers for Lyon County from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), 2007 U.S. Benchmark I-O Data and 2016 Regional Data.

Calculation Note: Direct x Multiplier = Total Impact

Total Impact - Direct Impact = Indirect & Induced Impact

Numbers may not add exactly due to rounding.

[8] Lyon County imposes 0.25 percent sales and use tax for judicial and/or public safety infrastructure projects.

- Therefore, the total direct and indirect benefits of construction activity associated with a 75 MW-geothermal energy facility in Lyon County is an estimated $14.9 million in total output ($10.9 million direct output + $4 million indirect and induced output) produced by 26 employees (18 direct employees + 8 indirect employees) earning a total of about $2.3 million ($1.8 million direct earnings + $505,000 indirect earnings) during the construction period (Table 9).
- Construction benefits are temporary, occurring only during construction. The analysis does not indicate whether the direct and indirect employees were residents of Lyon County or whether they were nonresidents that commuted into the area.

ON-GOING ANNUAL OPERATIONS

Direct Economic and Fiscal Benefits

- Based on estimates derived from the JEDI model, annual purchases of materials and equipment for a 75 MW-geothermal energy facility could be an estimated $4 million. Materials and equipment purchases will generate sales and use tax revenue for the county (Table 10).
- Lease payments would likely comprise part of the direct economic benefit of a new geothermal facility. This analysis assumes the land will be leased from the Bureau of Land Management. Based on estimates in the JEDI model for a lease of 2,420 acres, a lease could be an estimated $12,100 (Table 10).

Table 10: Direct Economic and Fiscal Benefit of Annual Operations of a 75 MW-Geothermal Facility in Lyon County

	Estimated Lyon County
Direct Economic Benefits	
Materials and Equipment	$3,961,100
Lease Payments	$12,100
Wages and Salaries	$2,160,400
Employee Benefits	$925,900
Total Operations Benefits	**$7,059,500**
Employees (FTE)	21
Direct Fiscal Benefits	
Property Tax*	$293,700
Sales and Use Tax	
County Option	$9,900
Basic City-County Relief	$19,500
Total	$29,400
Total Fiscal Benefits	**$323,100**
Total Economic and Fiscal Benefits	**$7,382,600**

**Represents average over first 10 years of operations based on depreciation.*

- A new 75 MW-geothermal energy facility will support on-going employment in Lyon County with high-paying jobs. Based on estimates from the JEDI model, the facility could employ 21 workers. Compensation for these employees could be an estimated $3.1 million in wages and employee benefits (Table 10).

- A new 75 MW-geothermal energy facility could generate property tax revenue for the county. This analysis assumes that the facility will receive a partial tax abatement incentive, equal to 55 percent of the taxes on real and personal property each year. The analysis also assumes local assessment and depreciation of real property based on the state's depreciation schedule. Based on the estimated value of the facility, depreciation for the property averaged over the first 10 years of operations, and the county tax rate of $0.9287 per $100 of assessed valuation, the county could benefit from $293,700 in property tax revenue (Table 10).
- Purchases of materials and equipment generate sales and use tax that could benefit Lyon County. Based on estimated purchases for the facilities, the direct fiscal benefit to Lyon County of a new 75 MW-geothermal energy facility could be an estimated $29,400. This would be comprised of an estimated $9,900 for the 0.25 percent optional county sales and use tax and $19,500 based on the 0.5 percent basic city-county relief tax. The county could also benefit from the 1.75 percent supplemental city-county relief tax. However, the distribution of this tax is not based on where the tax was collected and is not included in this analysis (Table 10).[9]
- In total, the direct economic and fiscal benefits of annual operations for a 75 MW-geothermal energy facility in Lyon County could be an estimated $7.4 million (Table 10).

Direct, Indirect, and Induced Economic Benefits

- Based on the industry relationships revealed through the RIMS II multipliers for industries that will be impacted by the potential business spending in Lyon County, $7.4 million of direct output will likely support an estimated $1.5 million in additional output in all industries throughout Lyon County. This includes the value of the local spending by the employees (the induced impact) and of the local supplier companies and their employees (the indirect impact) (Table 11).

Table 11: Total Economic Benefit of Annual Operations of 75 MW-Geothermal Facility in Lyon County

	Direct Impact	Multiplier	Indirect & Induced Impact	Total Impact
Operations and Maintenance				
Value of Output ($M)	$7.4	1.2009	$1.5	$8.9
Earnings ($M)*	$2.4	1.3031	$0.7	$3.1
Employment	21	1.9841	21	42

**Direct earnings estimate includes adjustment for the percent of employee benefits likely spent locally.*
Source: Development Research Partners, based on multipliers for Lyon County from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), 2007 U.S. Benchmark I-O Data and 2016 Regional Data.
Calculation Note: Direct x Multiplier = Total Impact
Total Impact - Direct Impact = Indirect & Induced Impact
Numbers may not add exactly due to rounding.

- The production of the $1.5 million in additional output in all industries throughout Lyon County will require an estimated 21 workers, referred to as the indirect workers. These workers will have estimated earnings of about $715,000 (the indirect earnings) (Table 11).
- Therefore, the total direct and indirect benefits of annual operations for a new 75 MW-geothermal energy facility in Lyon County is an estimated $8.9 million in total output ($7.4 million direct output + $1.5 million

[9] Distribution of the supplemental city-county relief tax factors in prior fiscal-year collections statewide, the percentage change in the county population, and changes in the Consumer Price Index.

indirect and induced output) produced by 42 employees (21 direct employees + 21 indirect employees) earning a total of about $3.1 million ($2.4 million direct earnings + $715,000 indirect earnings) (Table 11).

- These benefits are likely to occur annually assuming similar business conditions and project parameters.

CASE STUDY: POTENTIAL BENEFITS OF NEW PV FACILITY

Nye County is a prime location for solar resources and is already home to the 125 MW Crescent Dunes solar plant, a large concentrating solar thermal facility. A significant portion of the investment associated with construction of new renewable energy facilities can benefit local workers and businesses. This case study estimates the potential benefits that could be realized if a 100 MW-solar photovoltaic (PV) energy project were developed in Nye County. Communities and areas with similar industries, workforces, and tax structures could realize similar benefits from the development of a new solar PV facility. A new 100 MW-solar PV project could cost an estimated $248.4 million, based on estimates derived from the JEDI model and adjusting for cost reductions.

Table 12: Potential 100 MW-Solar PV Energy Facility Construction Activity in Nye County

Construction Activity ($ in millions)	
Major Equipment	$77.2
Construction Materials	$26.5
Design, Engineering, Planning, Other Costs	$104.4
Wages and Salaries	$28.2
Employee Benefits	$12.1
Total	**$248.4**
Construction Employees (FTE)	335

CONSTRUCTION AND INVESTMENT ACTIVITY

Direct Economic and Fiscal Benefits

- An estimated $77.2 million could be spent on purchases of major equipment such as solar PV modules (Table 12). These purchases are expected to occur outside of the county, with no direct economic benefit for county-based businesses (Table 13).
- While the purchases of the plant equipment will likely be outside the county, the county could benefit from construction materials purchases. The county could capture a portion of the design, planning, and other costs. Based on the concentration of establishments, employees, and sales in Nye County and estimated purchases captured in the state from the JEDI model, the direct economic benefit of local purchases of construction materials, design, engineering, planning, and other costs could be an estimated $1.3 million (Table 13).
- An estimated 335 FTE construction workers earning $40.3 million in wages and employee benefits could be employed during the development of a potential solar PV facility (Table 12). Based on estimates of local labor and adjusting wages based on abatement awards and state wage levels, the direct economic benefit to Nye County could be an estimated $716,500 in earnings for 7 local workers (Table 13).
- Purchases of equipment and materials for constructing a solar PV facility could generate sales and use tax revenue for local schools. While the county could benefit from a portion of the local school support tax revenue, the distribution of the tax has not been estimated for this analysis. This analysis assumes that the project would qualify for the state's renewable energy tax abatements that would include an abatement from Nye County's optional taxes.[10]

[10] Nye County imposes 0.25 percent sales and use tax rate for public mass transportation/construction of roads/improvements to air quality and a rate of 0.5 percent to support public safety services.

- In total, the direct economic benefit to Nye County of construction and investment associated with a 100 MW-solar PV energy facility could be an estimated $2 million (Table 13).

Table 13: Direct Economic Benefits of 100 MW - Solar PV Energy Facility Investment in Nye County

	Estimated Nye County
Direct Economic Benefits	
Major Equipment	$0
Construction Materials	$72,500
Design, Engineering, Planning, Other Costs	$1,231,300
Wages and Salaries	$620,700
Employee Benefits*	$95,800
Total Construction Benefits	**$2,020,300**
Construction Employees (FTE)	7

**Direct benefit estimated for Nye County includes adjustment for the percent of employee benefits likely spent locally.*

Direct, Indirect, and Induced Economic Benefits

- Based on the industry relationships revealed through the RIMS II multipliers for the construction industry in Nye County, $2 million of direct construction spending in Nye County will likely support an estimated $492,000 in additional output in all industries throughout the county. This includes the value of the local spending by the construction workers (the induced impact) and of the local supplier companies and their employees (the indirect impact) (Table 14).
- The production of the $492,000 in additional output in all industries throughout Nye County will require an estimated 2 workers, referred to as the indirect workers. These workers will have estimated earnings of about $108,000 (the indirect earnings) (Table 14).

Table 14: Total Economic Benefit of 100 MW - Solar PV Energy Facility Investment in Nye County

	Direct Impact	Multiplier	Indirect & Induced Impact	Total Impact
Construction Activity				
Value of Output ($M)	$2.0	1.2433	$0.5	$2.5
Earnings ($M)	$0.7	1.1508	$0.1	$0.8
Employment	7	1.2451	2	9

Source: Development Research Partners, based on multipliers for Nye County from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), 2007 U.S. Benchmark I-O Data and 2016 Regional Data.

Calculation Note: Direct x Multiplier = Total Impact

Total Impact - Direct Impact = Indirect & Induced Impact

Numbers may not add exactly due to rounding.

- Therefore, the total direct and indirect benefits of construction activity associated with a 100 MW-solar PV energy facility in Nye County is an estimated $2.5 million in total output ($2 million direct output + $492,000 indirect and induced output) produced by 9 employees (7 direct employees + 2 indirect employees) earning a total of about $825,000 ($717,000 direct earnings + $108,000 indirect earnings) during the construction period (Table 14).

- Construction benefits are temporary, occurring only during construction. The analysis does not indicate whether the direct and indirect employees were residents of Nye County or whether they were nonresidents that commuted into the area.

ON-GOING ANNUAL OPERATIONS

Direct Economic and Fiscal Benefits

- Based on estimates derived from the JEDI model and adjusting for cost reductions, annual purchases of materials and equipment for a 100 MW-solar PV energy facility could be an estimated $255,200. Materials and equipment purchases will generate sales and use tax revenue for the county (Table 15).
- Land for large renewable energy facilities is often leased, from public or private landowners. It is likely that land for a 100 MW-solar PV facility would be leased. However, the cost of leasing will depend on location, market conditions, public or private ownership, and other factors that are not estimated in this analysis.
- A new 100 MW-solar PV energy facility will support on-going employment in Nye County with high-paying jobs. Based on estimates from the JEDI model and adjusting for cost reductions, the facility could employ nine workers. Compensation for these employees will be an estimated $875,000 in wages and employee benefits (Table 15).

Table 15: Direct Economic and Fiscal Benefit of Annual Operations of a 100 MW-Photovoltaic Facility in Nye County

	Estimated Nye County
Direct Economic Benefits	
Materials and Equipment	$255,200
Wages and Salaries	$612,500
Employee Benefits	$262,500
Total Operations Benefits	**$1,130,200**
Employees (FTE)	9
Direct Fiscal Benefits	
Property Tax*	$487,600
Sales and Use Tax	
County Option	$1,900
Basic City-County Relief	$1,300
Total	$3,200
Total Fiscal Benefits	**$490,800**
Total Economic and Fiscal Benefits	**$1,621,000**

**Represents average over first 10 years of operations based on depreciation.*

- A new 100 MW-solar PV energy facility will generate property tax revenue for the county. This analysis assumes that the facility will receive a partial tax abatement incentive, equal to 55 percent of the taxes on real and personal property each year. The analysis also assumes local assessment and depreciation of real property based on the state's depreciation schedule. Based on the estimated value of the facility, depreciation for the property averaged over the first 10 years of operations, and the county tax rate of $1.3468 per $100 of assessed valuation, the county will benefit from $487,600 in property tax revenue (Table 15).

- Purchases of materials and equipment generate sales and use tax that will benefit Nye County. Based on estimated purchases for the facilities, the direct fiscal benefit to Nye County of a new 100 MW-solar PV energy facility could be an estimated $3,200. This would be comprised of an estimated $1,900 for the 0.75 percent of optional county sales and use taxes and $1,300 based on the 0.5 percent basic city-county relief tax. The county could also benefit from the 1.75 percent supplemental city-county relief tax. However, the distribution of this tax is not based on where the tax was collected and is not included in this analysis (Table 15).
- In total, the direct economic and fiscal benefits of annual operations for a 100 MW-solar PV energy facility in Nye County could be an estimated $1.6 million (Table 15).

Direct, Indirect, and Induced Economic Benefits

- Based on the industry relationships revealed through the RIMS II multipliers for industries that will be impacted by the potential business spending in Nye County, $1.6 million of direct output will likely support an estimated $316,000 in additional output in all industries throughout Nye County. This includes the value of the local spending by the employees (the induced impact) and of the local supplier companies and their employees (the indirect impact) (Table 16).
- The production of the $316,000 in additional output in all industries throughout Nye County will require an estimated 8 workers, referred to as the indirect workers. These workers will have estimated earnings of about $218,000 (the indirect earnings) (Table 16).
- Therefore, the total direct and indirect benefits of annual operations for a new 100 MW-solar PV energy facility in Nye County is an estimated $1.9 million in total output ($1.6 million direct output + $316,000 indirect and induced output) produced by 17 employees (9 direct employees + 8 indirect employees) earning a total of about $893,000 ($675,000 direct earnings + $218,000 indirect earnings) (Table 16).
- These benefits are likely to occur annually assuming similar business conditions and project parameters.

Table 16: Total Economic Benefit of Annual Operations of 100 MW-Photovoltaic Facility in Nye County, 2018

	Direct Impact	Multiplier	Indirect & Induced Impact	Total Impact
Operations and Maintenance				
Value of Output ($M)	$1.6	1.1952	$0.3	$1.9
Earnings ($M)*	$0.7	1.3232	$0.2	$0.9
Employment	9	1.9065	8	17

**Direct earnings estimate includes adjustment for the percent of employee benefits likely spent locally.*

Source: Development Research Partners, based on multipliers for Nye County from the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), 2007 U.S. Benchmark I-O Data and 2016 Regional Data.

Calculation Note: Direct x Multiplier = Total Impact

Total Impact - Direct Impact = Indirect & Induced Impact

Numbers may not add exactly due to rounding.

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