

# 5 reasons Missouri is right for solar energy



“With the Renewable Energy Standard of 2008, Missouri voters made it clear they want energy reform and less dependence on non-renewable sources of energy. Since then, our state has made significant strides in developing a strong solar sector and refining our photovoltaic resources. The result: Missouri has grown to become a premier location for solar generation and manufacturing and we’re on track to reach the two percent solar target within the next eight years.”—Governor Jay Nixon

Above: Solar array at the Moonrise Hotel in St. Louis. Image courtesy Microgrid Solar.

## 1 Missouri's pro-solar legislation ensures a growing market for manufacturers and suppliers.

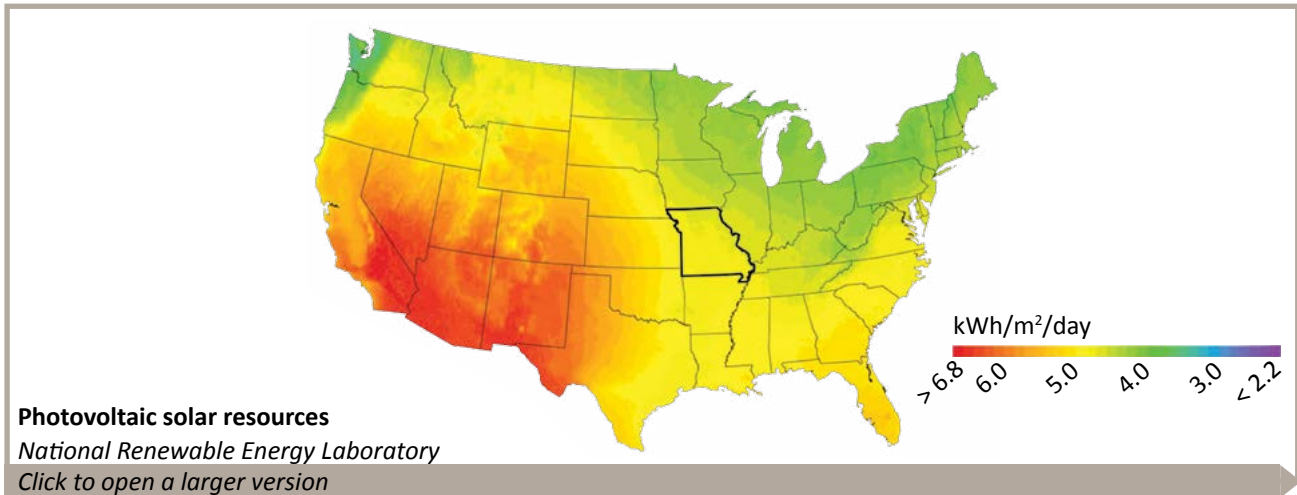
### MISSOURI QUICK FACTS:

- ▶ Missouri is one of only a few states to have a carve-out for solar written into its Renewable Portfolio Standard (RPS), and it is the only state to have passed such legislation by an overwhelming voter margin. By 2021, investor-owned utilities will be getting 15 percent of their power from renewable resources, with two percent coming from solar. With a modest estimate for growth between 2009 and 2021, the annual solar energy requirement in 2021 will reach just under 170 GWh, or approximately 130 MW of solar capacity.
- ▶ Missouri strives to make solar projects affordable and painless through a net metering act passed in 2007.

### Other advantages for solar energy in Missouri:

- Property Assessed Clean Energy (PACE) legislation passed in 2010, which allows commercial and residential property owners to finance energy efficiency and renewable energy retrofits with repayment over 20 years through annual assessments on property tax bills.
- Missouri's S.B. 54 streamlines the interconnection and tariff processes by requiring the state's electric utilities to offer net metering to renewable energy customers with systems up to 100 kW, thus encouraging on-site solar project deployment throughout the state.
- Commercial leasing opportunities are available in areas served by Missouri's investor-owned utilities, making it easier than ever for consumers to try solar.

## Missouri's natural resources for solar energy



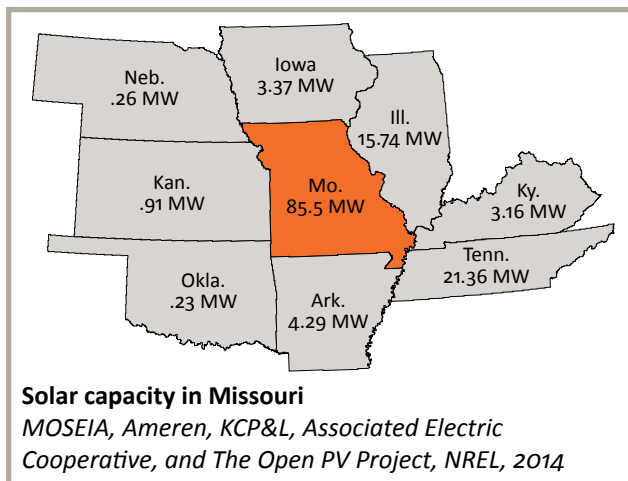
Click on [orange](#) text for a link to more information.

- Missouri's solar resources—between 4.5 to 5.0 kWh/m<sup>2</sup>/day—far exceed those of Germany, which leads the world in solar energy production ([National Renewable Energy Laboratory](#)).
- Missouri has over 200 sunny days per year ([NOAA, Comparative Climatic Data, Annual](#)).
- Devoting just three percent of Missouri's land to solar farms would provide enough electricity for every household in the state ([National Wildlife Federation](#)).
- Missouri has extensive deposits of high purity, readily accessible silica sand for solar panel production, present almost exclusively in the St. Peter Sandstone (Ordovician). This resource is found in a broad 150 mile curve on the eastern side of the state that varies from one to 10 miles in width and 63 to 71 feet in thickness.

## 2 Missouri's solar market is strong and consistently growing stronger.

### MISSOURI QUICK FACTS:

- ▶ Missouri solar installations have increased from 101 kW in 2009 to 85.5 MW in 2013. That's an increase of over 84,000 percent in five years.
- ▶ Solar capacity in Missouri tripled in 2013 according to a report from [The Environment Missouri Research & Policy Center](#).
- ▶ In 2013, 3M announced plans to expand its specialty solar panel film production line and add 50 jobs at its Columbia, Missouri, plant.
- ▶ Solar One in Columbia, Missouri, aims to fulfill one percent of the city's electric needs from local solar production by the year 2023.
- ▶ Both Major League Baseball parks in the state—Kauffman Stadium (Kansas City Royals) and Busch Stadium (St. Louis Cardinals)—have solar systems installed. The Kauffman Stadium array is the largest in Major League Baseball.



### KCP&L:

Click on [orange](#) text for a link to more information.

- KCP&L and Brightergy teamed up in Kansas City to install solar panels and equipment on more than 50 city buildings, including police and fire department facilities as well as most of the city's community centers, to meet part of their demand for electricity.
- KCP&L helped the Kansas City Royals go green with their installation of a 28.8 kW solar array at [Kauffman Stadium](#). This installation is the largest solar array in Major League Baseball and includes an educational kiosk to show fans how solar energy works. The array is comprised of 120 solar panels of 240-watt each, which will produce approximately 36,000 kWh of renewable energy each year. The energy will tie into Kauffman Stadium's distribution system and ultimately to KCP&L's grid.

- KCP&L and its partners are demonstrating an end-to-end **Smart Grid** that includes advanced generation, distribution and customer technologies. The demonstration area consists of two square miles serving 14,000 commercial and residential customers. As part of the project, approximately 100 kW of solar energy generation has been installed on the rooftop of the Paseo Academy of Arts, representing the largest solar energy system in the Kansas City metro area. One of KCP&L's goals for the solar installation was to create a partnership between solar vendors and the International Brotherhood of Electrical Workers (IBEW) for the purpose of developing new renewable energy skills among its members. In addition to this solar project, KCP&L has added another 80 kW of solar generation throughout the SmartGrid demonstration area.

#### **Ameren:**

- Ameren Corp. has five solar power systems capable of generating about 100 kW of power at its headquarters building in St. Louis. The installation uses three solar technology types—polycrystalline, monocrystalline and thin film—and a tracking system to test solar technologies against one another. This project allows Ameren's customers to select a PV system best suited to their needs by showing real time results of the three technologies.
- By the end of 2014, Ameren anticipates adding more renewable power to its grid with the construction of a 5.7 MW solar energy center in O'Fallon, Missouri. Ameren recently announced plans to add nearly 500 MW of renewable power generation over the next 20 years, including the construction of a second solar energy center in 2016 that would be the largest in the state of Missouri.
- **Ameren Transmission**, a subsidiary dedicated to electric transmission infrastructure investment, is expanding Ameren's already robust transmission system of more than 7,400 circuit miles of high-voltage transmission lines in Illinois and Missouri. The company will build greenfield transmission projects in the bi-state area, with a potential for expanding to other areas in the future.

#### **Municipal utility systems:**

- City Utilities in Springfield recently began operating a 4.95 MW solar system producing enough energy to power 875 homes.
- The Butler Solar Energy Farm began generating power in early 2014 for 35 public power utilities in Missouri. The facility has a capacity greater than 3 MW from more than 10,000 panels covering 12.6 acres.

#### **Rural electric cooperatives:**

- Missouri's electric cooperatives pioneered renewable wind energy in the state. Member-owned Associated Electric Cooperative provided the long-term purchase agreements and integrated transmission system that enabled the state's first utility-scale wind farms to be built in northwest Missouri.
- In addition to commercial scale wind energy contracted by Associated Electric, rural electric cooperatives continue to see substantial growth in the number of small scale solar and wind units installed on co-op homes and businesses. By mid-August 2014, member-consumers' wind installations totaled 76, while solar installations totaled 223 and equaled 1,546 kW.

### Columbia area:

- Columbia started a solar utility in 2008 called Solar One, with the goal of producing one percent of Columbia's electric needs from local solar production by 2023 and making solar available to customers on a voluntary basis. Columbia's demonstrated interest in local solar has allowed the utility to expand the program to other subscribers and reduce the cost to participants. Solar One presently has 37 kW of installed arrays, 17 kW of which is generated from panels provided by Dow Chemical, including the company's new POWERHOUSE Solar Shingles. The other 20 kW of solar is obtained by the city via purchase power agreements with Quaker Oats (15 kW) and Bright City Lights (5 kW).
- Since 2008 the municipally owned utility has offered \$500 per kW rebates for all solar installations, up to 10 kW. Larger installations may qualify for rebates if funds are available. The utility allows net metered solar systems to accrue rolling credits up to 12 months with an annual 'true-up' in March of each year.
- In 2010, Columbia entered into a solar lease agreement with Free Power Company, which developed a 327 kW grid tied solar installation on the Columbia Terminal Railroad's Colt Terminal facility.
- In 2014 the utility began a low interest rate-financing program for small scale solar systems with APRs as low as one percent.

### Kansas City area:

- Kansas City has a variety of solar installation sites: a retirement facility, several high schools, a coffee roasting facility, a fermentation lab, a construction company headquarters, and several water services and manufacturing facilities.

### Rolla area:

- Four solar homes in Missouri S&T's Solar Village recently installed an experimental microgrid to manage and store renewable energy. The PV arrays on the solar homes are designed to generate about 25 kW of power. Two lithium battery packs donated by A123 Energy Solutions provide 60 kilowatt hours of energy storage for the microgrid.

### St. Louis area:

- The City of Clayton's 490-panel solar array is the largest non-utility-owned, single-site solar generation unit and the only elevated array in Missouri. The nearly \$1 million solar project produces an estimated 204,000 kWh of energy on a yearly basis, offsetting more than one-third of the energy consumption of the building on which it is located.
- Microgrid Solar installed the first restaurant roof in the United States made entirely of solar panels on the Moonrise Hotel, located in St. Louis' Delmar Loop.
- The St. Louis Cardinals partnered with Microgrid Solar, the Electrical Connection and Sachs Electric, to bring solar energy to Busch Stadium. The project includes 106 solar panels, producing approximately 32,000 kWh of solar energy per year.



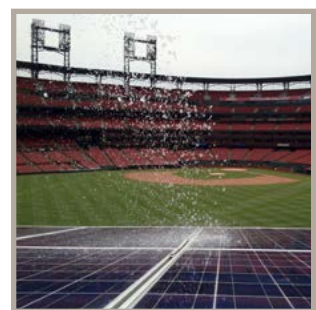
Bright City Lights, Columbia  
image courtesy of Columbia  
Power and Light



Solar Village, Rolla  
image courtesy of Missouri S&T



Moonrise Hotel, St. Louis  
image courtesy of Microgrid Solar



Busch Stadium, St. Louis  
image courtesy of Microgrid Solar

## Missouri solar energy companies

### Solar manufacturers:

Click on *orange* text for a link to more information.

- **3M** (Columbia) recently announced another expansion of its solar-film manufacturing plant in Missouri, adding 50 jobs. The plant makes Ultra Barrier Solar Film for solar cells, which reduces the weight of the panels and lowers costs for manufacturers.
- **A123 Energy Solutions** (St. Louis), a division of A123 Systems LLC and a part of Wanxiang Group, designs and manufactures high performance, efficient, safe and reliable advanced battery systems for electric grid, backup power and lead acid replacement applications.
- **Emerson Electric Co.** (HQ St. Louis) manufactures inverters and controls for the solar industry as well as solar e-houses, pre-built concrete or steel shelters for inverters, transformers, switchgear and other equipment that can be transported and installed at a solar site.
- **Hubbell Power Systems** (Centralia) manufactures solar helical foundations as well as a wide variety of transmission, distribution, substation, OEM and telecommunications products used by utilities.
- **SunEdison** (HQ St. Louis) is the largest solar developer in the U.S. and a global leader and industry pioneer in the manufacture and sale of wafers and related products to the semiconductor and solar industries.
- **MidAmerica Solar LLC** (Imperial) developed the Twain Technology Lighting System, a street light powered solely by wind and solar. It is completely sustainable and off-grid and can be placed almost anywhere.
- **Milbank Manufacturing** (Kansas City) recently set up new production lines for renewable energy products to integrate power sources such as wind, solar, water, generators and power management.
- **Watlow** (HQ St. Louis) manufactures a broad range of heaters, sensors, and controllers specifically for use in the photovoltaic cell and module manufacturing industry.

### Solar installers:

- **Ampray Solar** (Kansas City)
- **Artisun Solar** (Kansas City)
- **Brightergy Solar Solutions** (HQ Kansas City and St. Louis)
- **CMO Solar** (Warrensburg)
- **Dogwood Solar** (Columbia)
- **EFS Energy** (St. Louis)
- **Energy Team in Missouri** (St. Louis)
- **Free Energy** (Blue Springs)
- **Good Energy Solutions** (Kansas City)
- **Gray Electric** (Meadville)
- **G2Power Tech** (St. Louis)

- **Heartland Alternative Energy** (St. Louis)
- **Homoly Solar** (Kansas City)
- **Lake Ozark Solar** (Lake Ozark)
- **MC Power** (Lee's Summit and Sedalia)
- **Microgrid Solar** (Clayton)
- **MidAmerica Solar LLC** (Imperial)
- **Midwest Solar Distributors** (Hermann)
- **Miriah Development** (Lake Ozark)
- **Missouri Solar Applications** (Jefferson City)
- **Missouri Solar Solutions** (Boonville)
- **Missouri Sun Solar** (St. Louis)
- **Missouri Valley Renewable** (Hermann)
- **OTG Solar Solutions** (Columbia and Kirksville)
- **Ozark Energy Services** (Joplin)
- **PennTech** (Kansas City)
- **Power Source Solar, Inc** (Springfield)
- **Roof Power Solar** (Rich Hill)
- **Skywire Electrical Systems** (Springfield)
- **Solar Design Studio** (Kansas City)
- **Solar Energy Company of Missouri and Mid America** (St. Joseph)
- **Solar Link Technologies, Inc.** (Kansas City)
- **Solar Side Up** (Kansas City)
- **Solexus Development** (O'Fallon)
- **Solsource Greenbuild** (Neosho)
- **Son Solar Systems** (Hartsburg)
- **SunSmart Technologies** (Kansas City)
- **SunSource Homes** (Kansas City)
- **Sun Vest Solar** (Pacific)
- **Synergy Energy** (Hazelwood)
- **StraightUp Solar** (St. Louis)
- **Tech Power Systems** (Kansas City)

#### **Solar equipment repair:**

- **Environmental Temperature** (Kansas City)
- **Sunworks Energy Alternatives** (Columbia)

#### **Solar project engineering, construction, and development:**

- **Abeinsa** (St. Louis)
- **Alberici Construction** (St. Louis)



- Bill Oakley Construction (Caulfield)
- Burns & McDonnell (HQ Kansas City)
- Envision Development Corp (Lee’s Summit)
- Flowers Energy Consulting (St. Louis)
- Hathmore Technologies (Blue Springs)
- Sachs Electric (Fenton)
- Sunwheel Energy Partners (St. Louis)

**Solar distributors:**

- Crescent Electric Supply Company (St. Louis)
- French Gerleman (HQ St. Louis, Columbia, Kansas City and Washington)
- Gexpro (Fenton and Riverside)
- Graybar (St. Louis)
- Metro Electric Supply (St. Louis, Ballwin, Cape Girardeau, O’Fallon, Arnold)
- Midwest Solar Distributors (Hermann)
- Missouri Wind and Solar (Seymour)

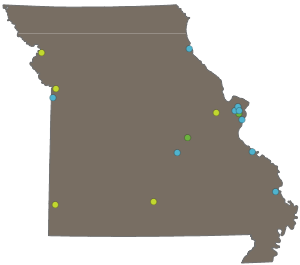
**Solar financial services:**

- US Bancorp Community Development Corporation (St. Louis)

**Law firms that specialize in solar energy:**

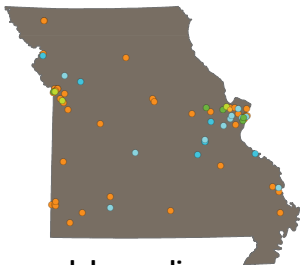
- Jeffrey Law Group (St. Louis)
- Polsinelli (Kansas City and St. Louis)

- Inorganic chemicals
- Industrial gas
- Other organic chemicals



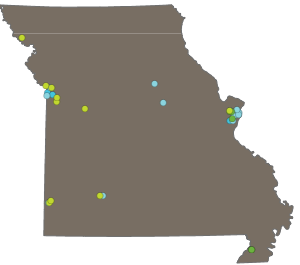
**Solar chemical manufacturers**  
[Click to open a larger version](#)

- Sheet metal work
- Unlaminated plastic film
- Plastic materials and resin
- Flat glass
- Semiconductors



**Solar module suppliers**  
[Click to open a larger version](#)

- Instruments for measuring/testing
- Electronic equipment
- Switchgear
- Batteries



**Solar system suppliers**  
[Click to open a larger version](#)

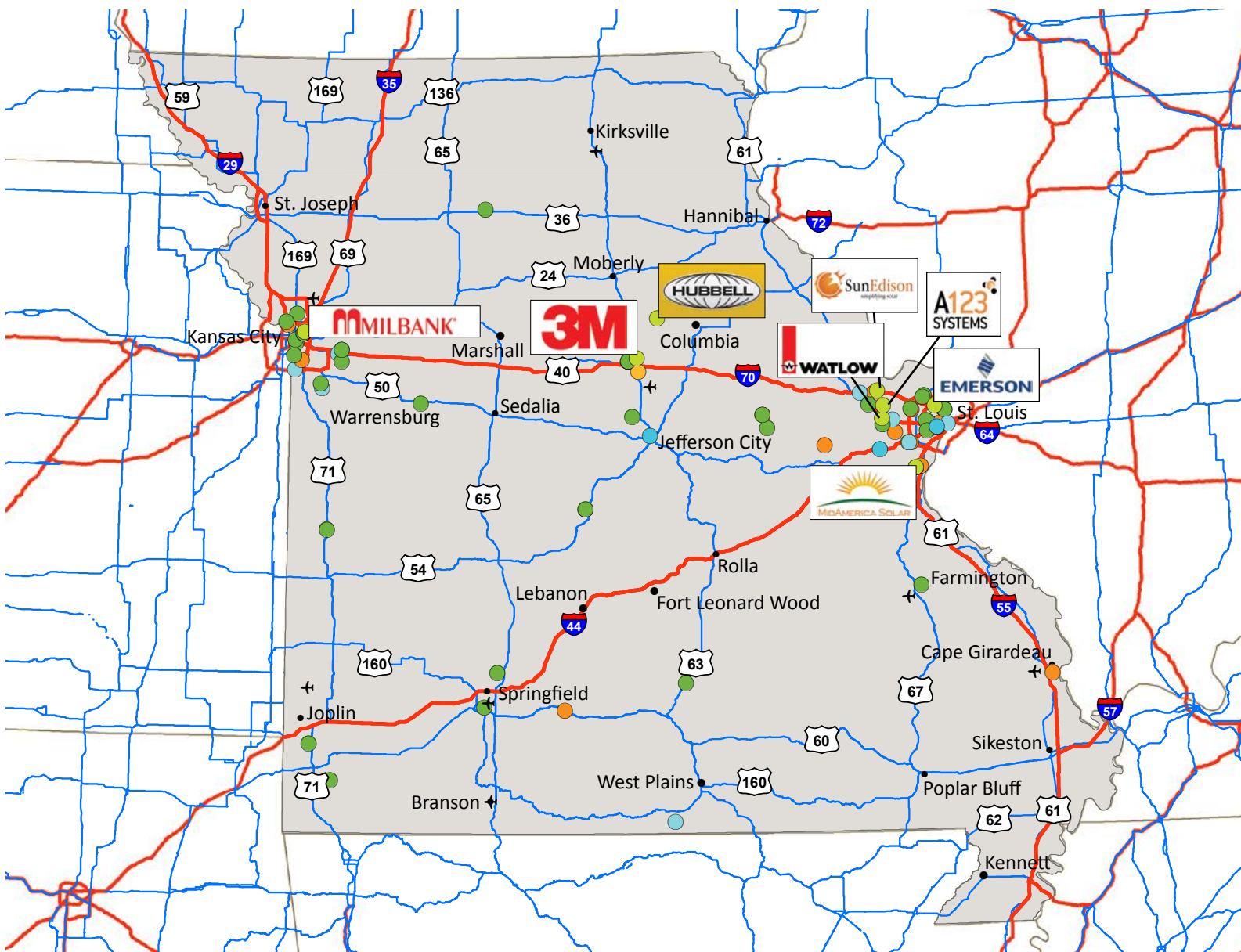
## Missouri's solar outreach

Organizations throughout the state are making it easier for homes and businesses to go solar:

- **Earthways Center of the Missouri Botanical Garden** (St. Louis) works directly with the general public as well as with green building professionals, auditors, contractors, businesses and local municipality leaders.
- **Heartland Renewable Energy Society (HRES)** (Blue Springs) furthers the development of renewable energy through support of related art, science and technology programs. HRES is the Missouri/Kansas chapter of the American Solar Energy Society.
- **Missouri Energy Initiative (MEI)** (Jefferson City) is a 501(c)(3) non-partisan think tank and resource on emerging energy issues that develops interactive and collaborative public/private partnerships and engages Missourians in energy education, science, technology, policy and activities.
- **Missouri Gateway Chapter of the U.S. Green Building Council** (St. Louis) was formed in 2001 to transform the built environment through green building practices and principles and has been consistently honored as one of the top USGBC chapters in the nation.
- **Missouri Solar Energy Industries Association (MOSEIA)** (St. Louis) represents solar industry stakeholders supporting policy issues focused on solar job creation and sustainable economic growth in Missouri. MOSEIA also provides professional development opportunities throughout the year that aim to raise industry standards.
- **Renew Missouri** (Columbia) was formed in 2006 to advance efficiency and renewable energy in Missouri.
- **St. Louis Science Center Experience Energy** exhibit devotes over 2,200 square feet to all things energy and features exhibits that show how wind, coal and solar power are converted to electricity. The gallery was made possible by a grant from the Department of Energy in partnership with Missouri University of Science and Technology. Contributors to the exhibit include Ameren, MicroGrid Solar and Peabody Energy.

# Missouri's solar energy companies

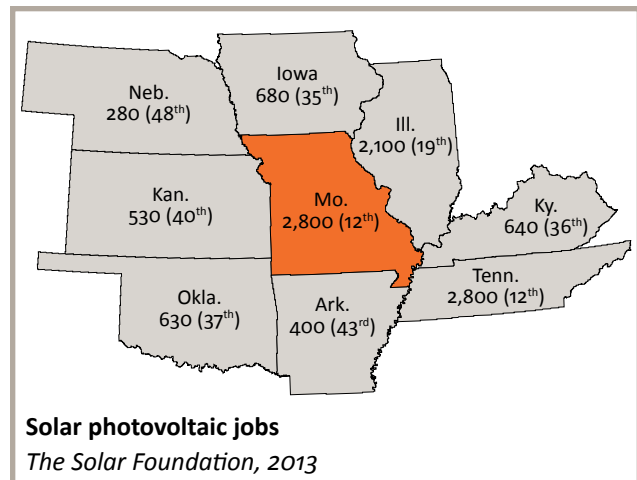
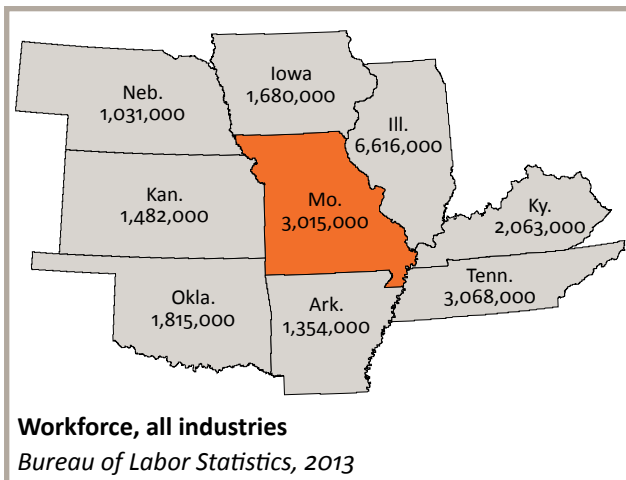
- Solar dealers and installers
- Solar equipment repair
- Solar project engineering and construction
- Solar distributors
- Solar outreach
- ✈ Major airport



### 3 Missouri has a large, highly trained workforce for solar

#### MISSOURI QUICK FACTS:

- ▶ Solar energy equipment manufacturers, installers and suppliers added 1,600 jobs in Missouri in 2013, one of the highest growth rates in the nation, according to a report from [The Solar Foundation](#). The state now ranks 12<sup>th</sup> in the country for the number of solar jobs, up from 20<sup>th</sup> just two years ago.
- ▶ Missouri's labor force of three million exceeds the entire populations of 20 states, including neighboring Kansas, Arkansas and Nebraska (Census Bureau, 2012).
- ▶ Training programs in alternative energy related fields are available across the state. Electrical Connection, based in St. Louis, is the largest Midwest resource for training electricians and communications technicians. More than 600 are trained in renewable energy installation, including solar, each year.
- ▶ Nearly 5,000 degrees in engineering fields are awarded each year in the state (National Center for Education Statistics, 2012).



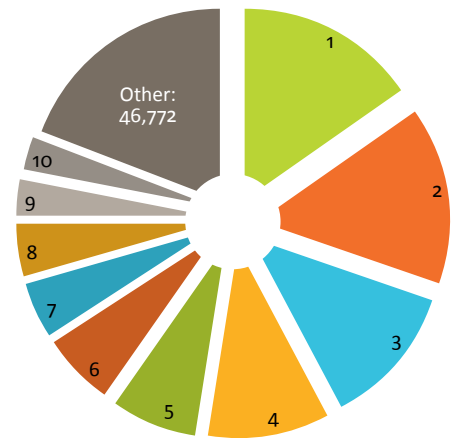
## Occupation information for the solar industry

Occupation code	Occupation title	Missouri employment	Missouri median hourly wage	U.S. median hourly wage
00-0000	All Occupations	2,639,120	\$15.55	\$16.87
17-0000	Architecture and Engineering Occupations	34,830	\$33.37	\$35.83
17-2041	Chemical Engineers	570	\$41.60	\$46.02
17-2071	Electrical Engineers	3,380	\$42.09	\$42.88
17-2081	Environmental Engineers	790	\$36.01	\$39.53
17-2141	Mechanical Engineers	3,770	\$37.06	\$39.47
17-3023	Electrical and Electronics Engineering Technicians	1,700	\$28.03	\$28.15
17-3024	Electro-Mechanical Technicians	50	\$24.11	\$24.68
17-3027	Mechanical Engineering Technicians	690	\$24.41	\$25.19
51-0000	Production Occupations	191,620	\$14.53	\$15.03
51-1011	First-Line Supervisors of Production and Operating Workers	11,720	\$23.67	\$26.29
51-2022	Electrical and Electronic Equipment Assemblers	4,090	\$15.53	\$15.07
51-2092	Team Assemblers	26,460	\$13.42	\$13.54
51-4041	Machinists	6,200	\$18.31	\$19.03

Bureau of Labor Statistics, May 2013

### Employment in manufacturing in Missouri:

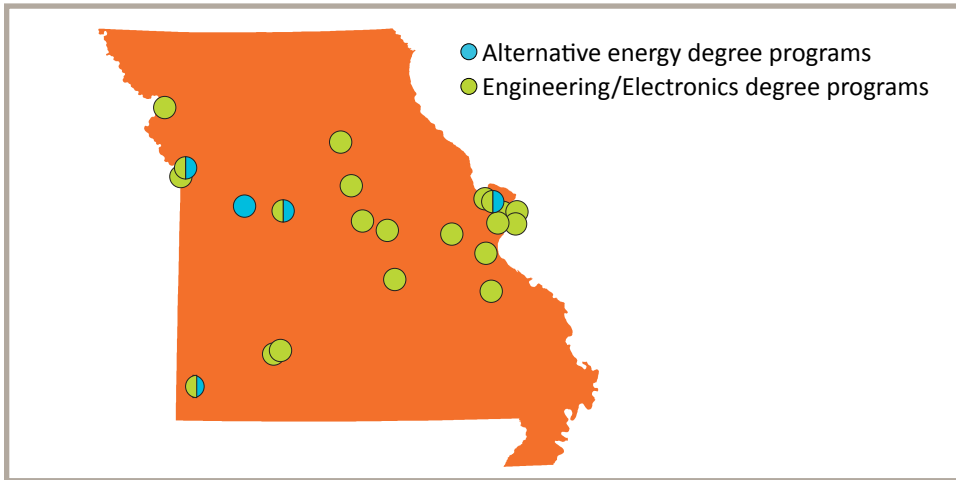
- |                                     |  |
|-------------------------------------|--|
| 1. Food Products: 38,798            | 6. Plastics/Rubber: 14,970                   |
| 2. Transportation equipment: 37,978 | 7. Printing: 12,514                          |
| 3. Fabricated metals: 30,379        | 8. Electrical equipment: 11,015              |
| 4. Machinery: 25,657                | 9. Miscellaneous: 7,501                      |
| 5. Chemicals: 18,648                | 10. Nonmetallic mineral manufacturing: 7,000 |



### Missouri's top manufacturing sectors by employment

BLS, Quarterly Census of Employment and Wages, 2013, preliminary

## Missouri's educational resources



### Alternative energy degree programs:

#### Two-year programs

- Crowder College: Associate of Art degree in alternative energy with solar emphasis
- Metropolitan Community College: Photovoltaics certificate and an energy efficiency certificate
- State Fair Community College: Associate of Applied Science degree in renewable energy

#### Four-year programs

- University of Central Missouri: Bachelor of Science degree in chemistry with an emphasis in alternative energy

### Engineering/Electronics degree programs:

- Missouri post-secondary educational institutions granted over 5,000 Engineering and Engineering Technology degrees in 2012 (*National Center for Education Statistics*).

#### Color indicates degree programs offered

Associate's: ■

Bachelor's: ■

Master's: ■

PhD: ■

#### Two-year programs

- Crowder College: ■
- East Central College: ■
- Jefferson College: ■
- Lincoln University: ■
- State Technical College of Missouri: ■
- Metropolitan Community College: ■

- Mineral Area College: ■
- Missouri Tech: ■
- Missouri Western State University: ■
- Moberly Area Community College: ■
- Ozarks Technical Community College: ■
- St. Charles Community College: ■
- St. Louis Community College: ■
- State Fair Community College: ■

#### **Four-year programs**

- Missouri Tech: ■
- Missouri State University: ■■
- Missouri S&T: ■■■
- Saint Louis University: ■
- The University of Missouri at Columbia: ■■■
- University of Missouri-Kansas City: ■■
- University of Missouri-St. Louis (Joint program with Washington University): ■
- Washington University: ■■■

#### **Crowder College:**

*Click on [orange](#) text for a link to more information.*

- [Crowder College](#) in Neosho, Missouri, is known for its programs in alternative energy, including an AA and AAS degree in Alternative Energy-Solar and an AS in Pre-Engineering with an Alternative Energy Option. Crowder also offers an Active Solar Technician Certificate.
- Several of Crowder's alternative energy programs are offered in cooperation with Missouri University of Science and Technology (Missouri S&T) in Rolla to give engineering and science students a foundation in solar technologies through applied research.

#### **Metropolitan Community College:**

- [Metropolitan Community College](#) in Kansas City offers a 35 credit hour Photovoltaics Certificate to prepare students for entry-level jobs in PV design, installation and sales. MCC prepares students for the NABCEP Entry Level PV Installer Exam.
- MCC also offers a 41 credit hour [Energy Efficiency Certificate](#) to prepare students for entry level jobs in a variety of areas, including retrofitting homes for energy efficiency and managing buildings for improved energy conservation and efficiency.

### Missouri University of Science and Technology:

- The Missouri University of Science and Technology (Missouri S&T) in Rolla recently received about \$4.3 million from the U.S. Department of Energy to support innovative solar energy research and development. The funds will be used to establish the Mid-America Regional Microgrid Education and Training Consortium (MARMET), which will help develop power engineering curriculum.
- The National Science Foundation's [Research Experience for Undergraduates](#) program at Missouri S&T focuses on technologies for renewable energy application and management.

### Other:

- [Electrical Connection](#) operates the Midwest's largest resource for training electricians and communication technicians, teaching more than 1,200 IBEW apprentices and journeymen each year. More than 600 workers are trained in the installation of solar panels and other renewable energy through Electrical Connection's partnership with the International Brotherhood of Electrical Workers Local 1 and the St. Louis chapter of the National Electrical Contractors Association.
- The Evergreen Institute's [Center for Renewable Energy and Green Building](#) in Gerald, Missouri, offers high-quality hands-on workshops in solar electricity (photovoltaics), wind energy, solar hot water (solar thermal) systems, and passive solar heating and cooling. The Center also offers workshops in residential energy efficiency, natural building, straw bale building, natural plasters, and green building.
- Microgrid Solar currently teaches a [North American Board of Certified Energy Practitioners \(NABCEP\) Installer](#) test prep course for St. Louis Community College.
- Ozarks Technical Community College's [Center for Workforce Development](#) offers courses in Solar Photovoltaic Design and Renewable Energy Basics.
- The [University of Central Missouri](#) in Lee's Summit offers a degree program in chemistry with a focus on alternative energy, environmental, and entrepreneurship.
- State Fair Community College in Sedalia offers an [Associate of Applied Science degree in Renewable Energy](#) as well as a Solar Electric Installation Skills Certificate.
- Washington University has the country's only department of [Energy, Environmental, and Chemical Engineering](#).



## 4 Missouri's established history of leadership in renewable energy research drives industry advancement.

### MISSOURI QUICK FACTS:

- ▶ Seven university centers focus on research and commercialization of renewable energy. Current projects include a grid intertie photovoltaic array system with solar panels.
- ▶ Crowder College produced the first solar car to cross the United States in 1984, and Missouri students have been designing, building, and improving on that technology ever since. Missouri University of Science and Technology (Missouri S&T) produced the winning vehicles at both Sunrayce and the North American Solar Challenge. University of Central Missouri students are designing a more cost-effective vehicle.
- ▶ Missouri S&T has also participated in multiple solar decathlons, sponsored by the U.S. Department of Energy. The houses built for these competitions provide living quarters for students and faculty committed to a sustainable lifestyle in what is known as the school's "Solar Village."
- ▶ New university departments have been developed to support the growing interest in alternative energy, including Missouri S&T's Office of Sustainable Energy and Environmental Engagement and Washington University in St. Louis's department of Energy, Environmental, and Chemical Engineering—the only one of its kind in the nation.

### Crowder College:

- Crowder College is home to the [Missouri Alternative and Renewable Energy Technology \(MARET\) Center](#) and produced the first solar car to cross the United States in 1984.

### Missouri University of Science & Technology (Missouri S&T):

- Missouri S&T finished first in [solar car](#) competitions Sunrayce (1999) and North American Solar Challenge (2003).
- [Missouri S&T](#) has participated in five U.S. Department of Energy Solar Decathelons in Washington, D.C., partnering with the University of Missouri. Missouri S&T was invited to compete in the U.S. Department of Energy Solar Decathlon 2015; their entry is called the Nest House.
- Missouri S&T partnered with Microgrid Solar to install the first microgrid in the U.S. to be centered around a [solar village](#). The solar houses that make up the village were built for past DOE Solar Decathlons and are leased to students and faculty committed to living a sustainable lifestyle.
- The [Office of Sustainable Energy and Environmental Engagement \(OSE3\)](#) at Missouri S&T fosters strategic alliances to support environmental and campus sustainability.

- Missouri S&T's **Energy Research and Development Center** conducts leading-edge renewable energy research, including the Renewable Energy Demonstration Project, a grid inter-tie wind turbine system and a grid inter-tie PV system with solar panels.
- Missouri S&T also has a **Materials Research Center** to provide graduate students with advanced training in materials related engineering and science research, ranging from fundamental science to applied engineering.

#### University of Central Missouri:

- University of Central Missouri's **Center for Alternative Fuels and Environmental Science (CAFES)** in Warrensburg is teaching students to build solar-powered vehicles that cost less than similar projects across the nation.

#### University of Missouri (MU):

- **Midwest Energy Efficiency Research Consortium (MEERC)** aims to develop academic courses and training programs to advance the comprehension, proficiency and development of energy efficient technologies. MEERC will be a consortium of six existing energy efficiency programs on campus.
- MU is also home to the **Missouri Industrial Assessment Center**, funded by the United States Department of Energy, which provides energy audits and productivity assessments for manufacturers in the state.
- The University of Missouri recognizes sustainable energy as an area of expertise through the "**Mizzou Advantage**." MU Sustainable Energy initiatives address energy issues broadly, building on MU's Research Reactor; MU's biomass power plant; research in biofuels, biomass and energy efficiency; the College of Engineering; and education programs in nuclear and other kinds of energy. This initiative also examines policy and its implications, business models, environmental impacts and the cultural and social consequences of energy uses and production.
- The University of Missouri recently received an award through ARPA-E's Full-Spectrum Optimized Conversion and Utilization of Sunlight (FOCUS) program, sponsored by Department of Energy (DOE), to support the development of a hybrid solar energy conversion system.

#### Washington University in St. Louis:

- The **International Center for Advanced Renewable Energy and Sustainability (I-CARES)** was created to encourage and coordinate collaborative research on energy, environment, and sustainability that could not be conducted by a single discipline alone. I-CARES fosters research on the development and production of biofuels, the exploration of sustainable alternative energy, and the exploration of environmental systems and practices.
- The **Photosynthetic Antenna Research Center (PARC)** at Washington University aims to understand the basic scientific principles that govern solar energy collection by photosynthetic organisms and plans to use this knowledge to enhance natural antenna systems and to fabricate biohybrid and bioinspired systems for light-harvesting.
- Washington University is part of a consortium of universities, laboratories, and industry partners launching the Solar Energy Research Institute. This initiative will coordinate efforts by the United States and India to create low-cost solar cells and systems.

## 5 Missouri's top-ranked transportation network can get your product to market faster and cheaper.

### MISSOURI QUICK FACTS:

- ▶ Shipping costs for utility-scale solar projects can account for two percent of the overall project cost—even more for commercial and residential projects. Missouri's transportation assets reduce those costs.
- ▶ Missouri has one of the best and least congested transportation networks in the United States, and the 6<sup>th</sup> largest public road and highway system (Federal Highway Administration, 2012).
- ▶ Kansas City and St. Louis are two of the three largest rail centers in the U.S., providing rail access to both eastern and western railroads.
- ▶ Missouri has the northernmost ice-free ports and the southernmost lock and dam on the Mississippi river, offering national and international companies the most efficient means of shipping.
- ▶ Missouri is three hours from most U.S. and Canadian cities by air. International service is accessible from Lambert-St. Louis International and Kansas City International.

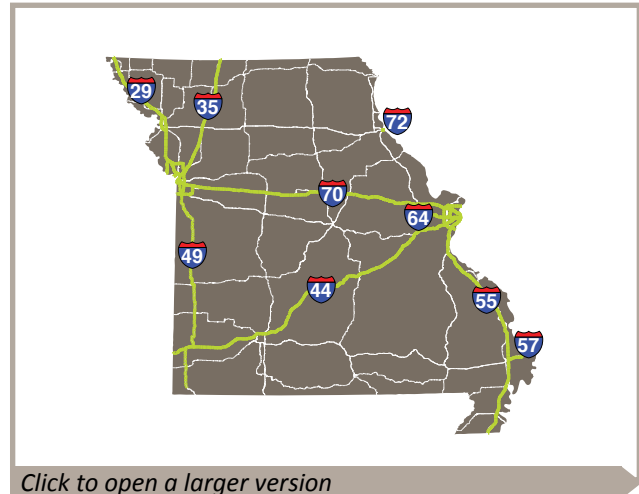
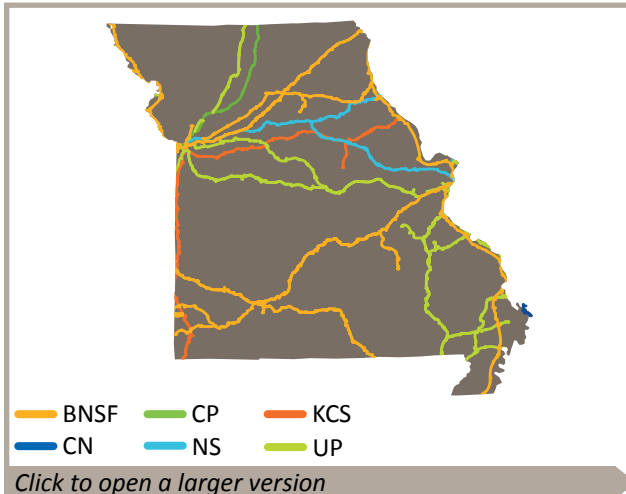


### Airports:

- The airport system in Missouri consists of approximately 130 public airports, with two airports supporting international traffic: Lambert-St. Louis International and Kansas City International (FAA, 2014).
- Springfield, Branson, Joplin, Columbia, Cape Girardeau, Kirksville and Waynesville (Fort Leonard Wood) also have commercial service.

### Foreign Trade Zones:

- Missouri has three foreign trade zones located in St. Louis, Kansas City and Springfield.
- The FTZ at St. Louis International Airport was recently expanded to include all of St. Louis City and St. Louis County under the Alternative Site Framework.
- The KCI Intermodal BusinessCentre includes 8,000 acres of multi-use land for development on the airfield, which has been designated as a FTZ and enhanced enterprise zone.

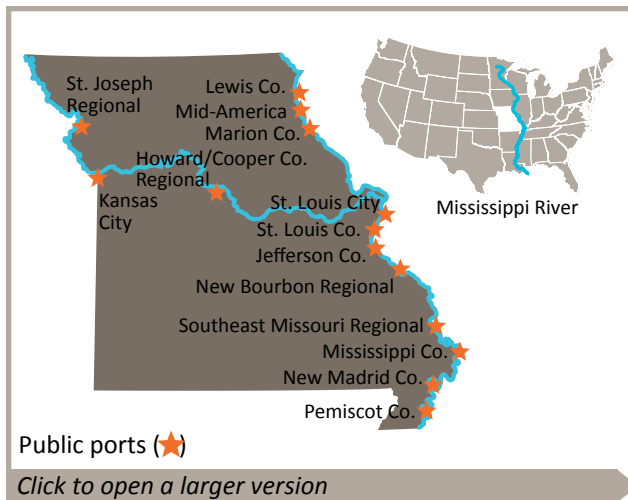


### Rail:

- Missouri provides efficient, low-cost shipping across the country via all Class I carriers: Burlington Northern Santa Fe (BNSF), Kansas City Southern (KCS), Norfolk Southern (NS), Union Pacific (UP), CSX, Canadian National Railway (CN) and Canadian Pacific (CP). It is one of the few states that can provide rail access to both east and west coasts.
- Missouri is ranked in the top 10 for U.S. railroad mileage with 3,958 miles (*Association of American Railroads, 2011*).
- Missouri is ranked 4<sup>th</sup> in tons and 3<sup>rd</sup> in rail carloads carried by state (*Association of American Railroads, 2011*).
- The 1,340 acre CenterPoint KCS Intermodal center (CIC-KC) includes a 1,000 acre industrial park located directly adjacent to the new Kansas City Southern Intermodal Facility. With infrastructure in place, these sites are shovel-ready for facilities up to a million square feet. KCS will offer direct rail service to CIC-KC from the natural deep-water port of Lazaro Cardenas, Mexico.

### Roads:

- Missouri has the 6<sup>th</sup> largest public road and highway system in the U.S. with 131,978 miles (*Federal Highway Administration, 2012*).
- Major interstates include I-64, I-44, I-70, I-55, I-35, I-29 and the newly designated I-49 which connects Kansas City to Joplin.
- I-70, which bisects Missouri, is over 2,000 miles long and passes through 10 states.
- I-29 and I-35 are both located within the NAFTA corridor, providing easy access to Canada and Mexico.



### Waterways:

- Missouri is ranked 10<sup>th</sup> for inland waterway mileage (1,000 miles), moving an average of \$4.1 billion in cargo annually.
- 29 industrial centers, with a combined population of 90 million, can be reached from St. Louis by barge. St. Louis is the northernmost point on the Mississippi River that normally remains ice-free and open throughout the year. The city is also the location of the southernmost lock and dam on the Mississippi (*Missouri Port Authorities*).
- Missouri has 14 strategically located public port authorities (*Missouri Port Authorities*).

The Missouri Partnership focuses on recruiting new business to the state, and is a non-profit corporation supported by the Missouri Department of Economic Development and the Hawthorn Foundation.

To find out how the Missouri Partnership can assist at any stage of your project, please contact us by:

mail: ■ 120 South Central Avenue, Suite 1535  
St. Louis, Missouri 63105

■ 12200 NW Ambassador Drive, Suite 234  
Kansas City, Missouri 64163

phone: 314.725.0949

e-mail: [info@missouripartnership.com](mailto:info@missouripartnership.com)

website: [www.missouripartnership.com](http://www.missouripartnership.com)

social media:

