

Missouri's Advantages for Solar Energy



As the sun rises each day, so do the opportunities for applying its power to our homes and businesses. Missouri colleges and universities are developing one-of-a-kind degree programs and research centers focused exclusively on energy. Meanwhile, Missouri manufacturers are likewise lighting the way for a strong solar supply chain.

Above: US Bank solar array in Clayton, Mo. Image courtesy Microgrid Solar.

“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 one percent solar target within the next eight years.”

— Governor Jeremiah W. “Jay” Nixon



Top five reasons to locate in Missouri:

1 Missouri’s pro-solar legislation and customer rebates ensure a growing market for manufacturers and suppliers.

- Missouri is one of only a few states to have a carve-out for solar energy 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; two percent will be 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) and a rebate of \$1.50 per watt on solar PV systems up to 25kW. Property Assessed Clean Energy (PACE) legislation allows property owners to finance renewable energy retrofits over 20 years through an annual assessment on property tax bills.
- Ameren, one of Missouri’s investor-owned utilities, offers an solar renewable energy credit (SREC) purchase incentive of \$5 per SREC.

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

- Missouri has over 19 MW of solar energy currently installed, a 19,000 percent increase in less than five years.
- In 2013, 3M announced plans to expand its specialty solar panel film production line at its Columbia, Mo. plant, adding 50 jobs.
- KCP&L has set up an end-to-end Smart Grid demonstration project, which includes approximately 100 kW installed on the rooftop of the Paseo Academy of Arts, located in the Green Impact Zone.
- Solar One of Columbia, Mo. 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—the Kansas City Royals and the St. Louis Cardinals—have solar systems installed. The Kauffman Stadium array (Royals) is the largest of any MLB ballpark.

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

- 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 6th largest public road and highway system by total mileage (*Federal Highway Administration, 2010*).
- Kansas City and St. Louis are two of the three largest rail centers in the U.S., providing access to both the great 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 just three hours from most U.S. and Canadian cities by air. International service is accessible from Lambert-St. Louis International and Kansas City International.

4 Missouri's got talent!

- Missouri's labor force of 3 million exceeds the entire populations of 20 states, including neighboring Kansas, Arkansas, and Nebraska (*Census Bureau, 2011*).
- Missouri ranked 6th in the nation for solar photovoltaic jobs in 2010, and 8th for growth of solar thermal jobs from 2003–2010 (*Brookings Clean Economy Jobs Report*).
- Training programs in alternative energy 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 4,000 degrees in engineering fields are awarded each year in the state (*NCES IPEDS, 2012*).

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

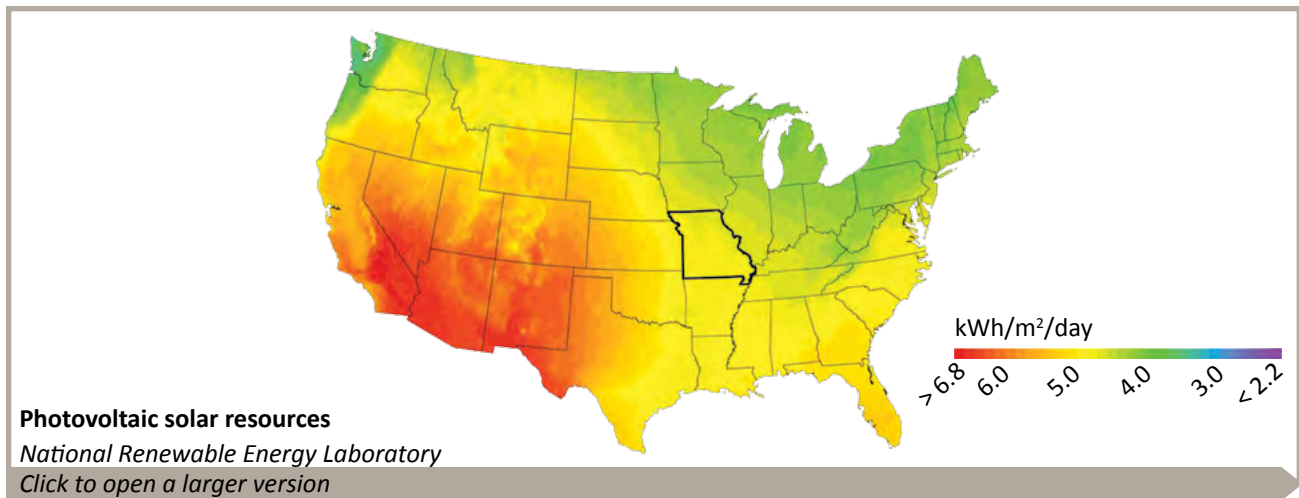
- Seven university centers focus on research and commercialization of renewable energy. Current projects include a grid intertie photovoltaic array system with solar panels.
- Crowder College produced the first solar car to cross the United States in 1984, and Missouri students have been designing, building, 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 cost-effective solar 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 now make up the school's "Solar Village," providing living quarters for students or faculty committed to a sustainable lifestyle.
- Universities have developed new departments 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.

1 Missouri's pro-solar legislation and customer rebates ensure a growing market for manufacturers and suppliers.

Solar advantages in Missouri

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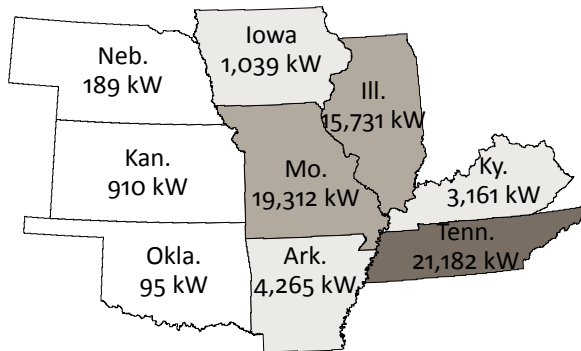
- Missouri is one of only a few states to have a carve-out for solar energy written into its Renewable Portfolio Standard (RPS), and it is the only state to have passed such legislation by an overwhelming voter margin. By 2021, investor-owned utilities will be getting 15 percent of their power from renewable resources; two percent will be 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) and a rebate of \$1.50 per watt on solar PV systems up to 25kW.
- PACE (Property Assessed Clean Energy) legislation passed in Missouri in 2010, allowing commercial and residential property owners to finance energy efficiency and renewable energy retrofits with repayment over 20 years via an annual assessment on their property tax bill. ([more](#))
- In 2007 Missouri enacted S.B. 54, requiring the state's electric utilities to offer net metering to renewable energy customers with systems up to 100 kW. The bill streamlines the interconnection and tariff processes, thus encouraging on-site solar project deployment throughout the state.
- Ameren, one of Missouri's investor-owned utilities, offers a purchase incentive of \$5 per solar renewable energy credit (SREC) that is created when you generate solar power. Ameren uses the SRECs they purchase to comply with the Missouri Renewable Energy Standard enacted by Proposition C. For solar-panel systems of capacity between 10 kilowatts and 100 kilowatts, Ameren offers customers the option of a one-time payment or annual payments. Their current tariff applies to solar-energy systems placed in service on or before December 31, 2014. ([more](#))
- Commercial leasing opportunities are now available in areas served by Missouri's investor-owned utilities, making it easier than ever for consumers to try solar.



Solar resources

- Missouri's solar resources—between 4.5 to 5.0 kWh/m²/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 to power 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 ten miles in width and 63 to 71 feet in thickness.

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



Missouri solar installations have increased from 101kW in 2009 to 19.3 MW in 2013. That's a 19,000 percent increase in four years.

Solar installations by state

MOSEIA, Ameren, KCP&L, and The Open PV Project, NREL, 2013

KCP&L

- KCP&L and Brightergy teamed up in Kansas City to install solar panels and equipment on 80 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. ([more](#))
- KCP&L and its partners are demonstrating an end-to-end SmartGrid 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) to develop new renewable energy skills among its members. In addition to this solar project, KCP&L plans to add another 80 kW of solar generation throughout the SmartGrid demonstration area. ([more](#))

Ameren

- Ameren Corp. recently installed five solar power systems capable of generating 100 kW of power at its headquarters building in St. Louis. The installation uses three solar technology types — poly-crystalline, monocrystalline and thin film — and a tracking system to test solar technologies against one another. This project will allow Ameren's customers to select a PV system best suited to their needs by showing real time results of the three technologies. Currently, Ameren's customers have installed 12 MW of solar generation, including the 100 kW installation at Ameren's headquarters.

- Ameren also recently created a new subsidiary dedicated to electric transmission infrastructure investment, expanding its already robust transmission system of more than 7,400 circuit miles of high-voltage lines in Illinois and Missouri. The new company, Ameren Transmission, will build greenfield transmission projects in the bi-state area, with a potential for expanding to other regions in the future. ([more](#))

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 Frito-Lay (15 kW) and Bright City Lights (5 kW).
- In December of 2010, the City of Columbia entered into a solar lease agreement with Free Power Corporation which will result in the largest installation of distributed solar in the Midwest, producing 1,000 kWh of energy per hour when completed. Construction began in 2012 on the 3,500-panel array.



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.
- John Knox Village, a retirement community, has one of the largest solar installations in Kansas City with six 25-kW systems, designed and installed by solar integrator Brightergy. Each of the systems includes 108 solar panels, for a total of 648 panels producing about 180,000 kWh per year.
- Western Extralite Co., a Liberty, Mo.-based distributor of electrical and data communication products, installed solar electrical-generation systems on the rooftops of six of its service centers in Sedalia, St. Joseph, and points between. The project has a combined total of 108 solar panels producing 150 kW.

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 kWh of energy storage for the microgrid.

Springfield area

- City Utilities in Springfield recently finalized an agreement to construct a 4.95 megawatt solar system producing enough energy to power 875 homes.



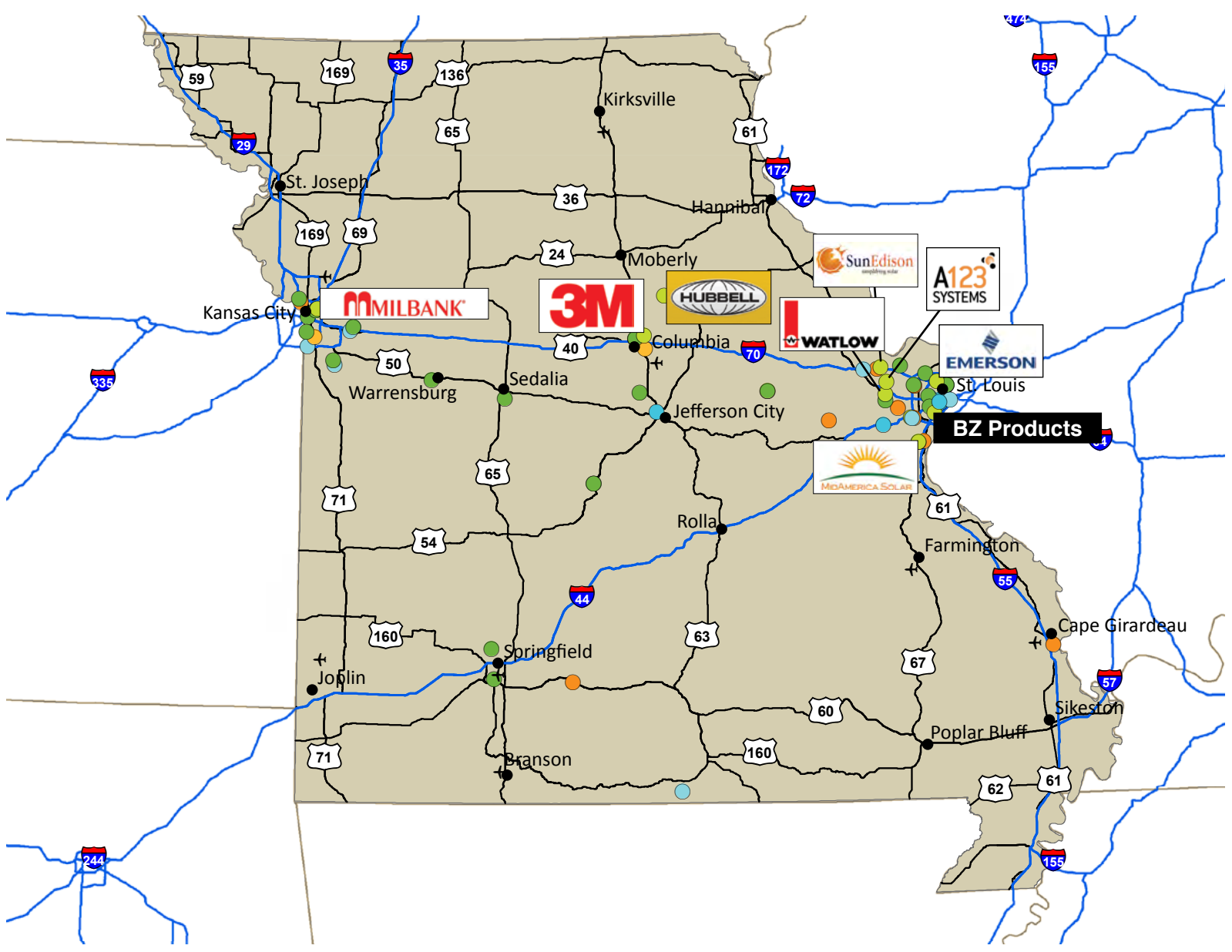
St. Louis area

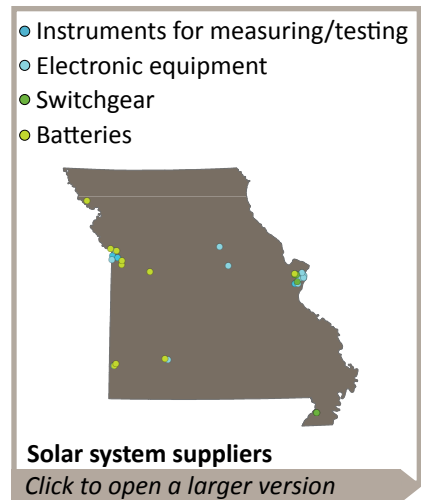
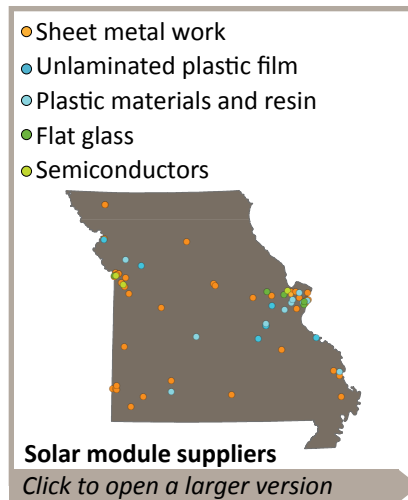
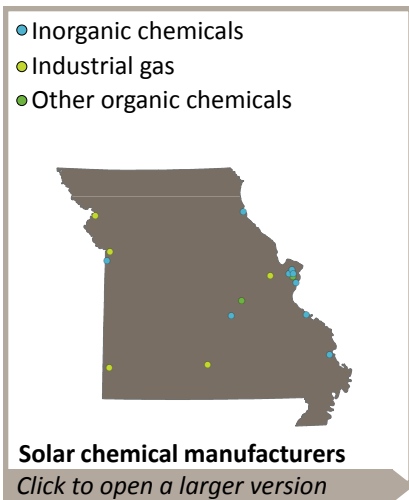
- The City of Clayton 490-panel solar array is the largest non-utility-owned, single-site solar generation unit and the only elevated array in Missouri. The nearly \$1 million solar project produces an estimated 204,000 kWh of energy on a yearly basis, offsetting more than one-third of the energy consumption 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. Unlike traditional solar modules, the glass panels that form the roof are frameless, translucent modules that take the place of a traditional roof, and which allow sunlight—and moonlight—to peek through. Dubbed the Moon Room, the 25.6 kW solar array produces nearly 33,000 kWh of electricity annually.
- 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.
- The St. Louis Housing Authority installed more than 2,000 solar panels in 2011 to create about 800 MWh of energy per year, enough electricity to power more than 70 homes. Sunwheel Energy Partners, an affiliate of McCormack Baron Salazar, owns the over 600 kW project and St Louis-based Microgrid Solar served as the owner's agent.
- Emerson Electric, a global manufacturing and technology company headquartered in St. Louis, has a data center powered by more than 550 solar panels. At peak output, the



Missouri's solar energy companies

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





Solar energy manufacturers

- 3M (Columbia) recently announced another expansion of their solar-film manufacturing plant in Missouri, adding 50 more jobs. The plant makes Ultra Barrier Solar Film for solar cells, which reduces the weight of the panels and lowers costs for manufacturers. ([more](#))
- 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. ([more](#))
- BZ Products (St. Louis) is a manufacturer of Maximum Power Point Tracking (MPPT) and conventional solar charge controls. ([more](#))
- 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. ([more](#))
- 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. ([more](#))
- 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. ([more](#))
- 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 it can be placed almost anywhere. ([more](#))
- 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. ([more](#))
- Watlow (HQ St. Louis) manufactures a broad range of heaters, sensors, and controllers specifically for use in the photovoltaic cell and module manufacturing industry. ([more](#))

Solar energy dealers and installers

- **Advanced Energy Corp.** (Sedalia)
- **Alternative Energy Company** (Springfield)
- **Brightergy Solar Solutions** (HQ Kansas City and St. Louis)
- **Certified Solar Solutions** (St. Charles)
- **CMO Solar** (Warrensburg)
- **Dogwood Solar** (Columbia)
- **Engineered Solar Solutions** (St. Louis)
- **Good Energy Solutions** (Kansas City)
- **Free Energy** (Blue Springs)
- **G2Power Tech** (St. Louis)
- **Heartland Alternative Energy** (St. Louis)
- **Lake Ozark Solar** (Lake Ozark)
- **Microgrid Solar** (Clayton)
- **MidAmerica Solar LLC** (Imperial)
- **Midwest Solar Distributors** (Hermann)
- **Miriah Development** (Lake Ozark)
- **Missouri Solar Applications** (Jefferson City)
- **Missouri Valley Renewable** (Hermann)
- **Ozark Energy Services** (Joplin)
- **Power Source Solar, Inc.** (Springfield)
- **Skywire Electrical Systems** (Springfield)
- **Solar and Wind KC** (Kansas City)
- **Solar Design Studio** (Kansas City)
- **Solar Outlet LLC** (Kansas City)
- **Solar Link Technologies, Inc.** (Lee's Summit)
- **Son Solar Systems** (Hartsburg)
- **SunSource Homes** (Kansas City)
- **Synergy Energy** (Hazelwood)
- **StraightUp Solar** (St. Louis)
- **Syndicated Solar** (St. Louis)
- **Tech Power Systems** (Kansas City)
- **US Solar** (St. Joseph)

Solar equipment repair

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

Solar energy project engineering, construction, and development

- [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 Alternative Energy](#) (Fenton)
- [Sunwheel Energy Partners](#) (St. Louis)

Solar energy distributors

- [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 energy financial services

- [US Bancorp Community Development Corporation](#) (St. Louis)

Law firms that specialize in solar energy

- [Posinelli](#) (Kansas City and St. Louis)

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. ([more](#))
- Heartland Renewable Energy Society (HRES) (Blue Springs) furthers the development of renewable energy through support of related art, science, and technology programs. The organization was created to inform institutional and governmental bodies, and raise awareness among the general public. HRES is the Missouri/Kansas chapter of the American Solar Energy Society. ([more](#))
- Missouri Energy Initiative (MEI) (Jefferson City) is a 501(c)(3) non-partisan think tank and resource on emerging energy issues. MEI was formed in 2009 to develop interactive and collaborative public/private partnerships and to engage Missourians in energy education, science, technology, policy, and activities. ([more](#))

- 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. The Missouri Gateway Chapter has been consistently honored as one of the top USGBC chapters in the nation. ([more](#))
- 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. ([more](#))
- Renew Missouri (Columbia) was formed in 2006 to advance efficiency and renewable energy in Missouri. ([more](#))
- 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. ([more](#))

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

Airports

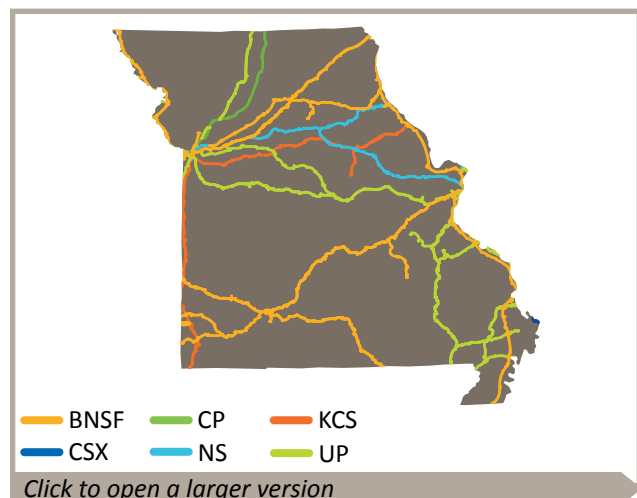
- Missouri travelers can reach most cities in the United States and Canada in less than three hours by air.
- The airport system in Missouri consists of 130 public airports, with two providing international service: Lambert-St. Louis International and Kansas City International.
- Springfield, Branson, Joplin, Columbia, Cape Girardeau, Kirksville and Waynesville (Fort Leonard Wood) also have commercial service.

Foreign trade zones

- Missouri has foreign trade zones in Kansas City, St. Louis, and Springfield.
- The FTZ at Lambert-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 designated FTZ and enhanced enterprise zone.

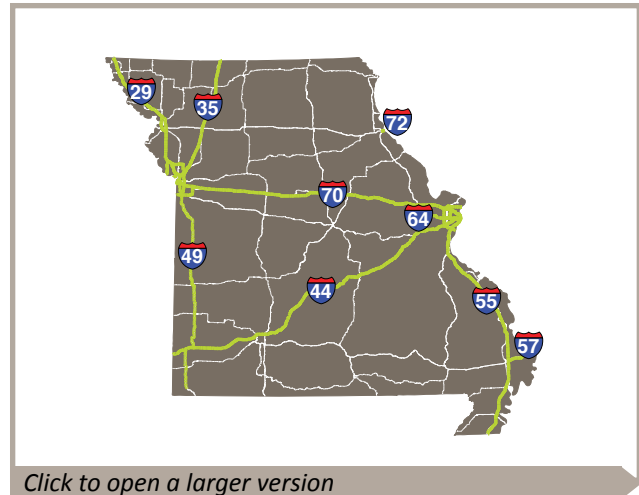
Rail

- 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 access to both east and west coasts.
- Missouri is ranked in the top ten for U.S. railroad mileage with 4,019 miles (*Association of American Railroads, 2010*).
- Missouri is ranked fourth in tons and third in rail carloads carried by state (*Association of American Railroads*).
- The 1,340 acre CenterPoint KCS Intermodal center includes a thousand 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 one million square feet. KCS will offer direct rail service to CIC-KC from the natural deepwater port of Lazaro Cardenas, Mexico.



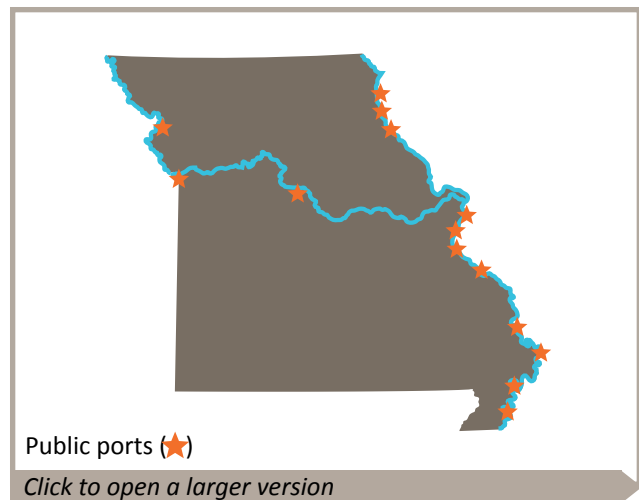
Roads

- Missouri has the 6th largest public road and highway system in the nation with 131,667 miles (*Federal Highway Administration, 2011*).
- 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.
- Interstates 29 and 35 are located within the NAFTA corridor, providing easy access to Canada and Mexico.
- Missouri ranked in the top 10 states for Federal highway funding in 2012, with \$1.5 billion (*Federal Highway Administration, 2011*).
- There are more than 110,000 commercial trailers registered in Missouri (*Bureau of Transportation Statistics, 2011*).



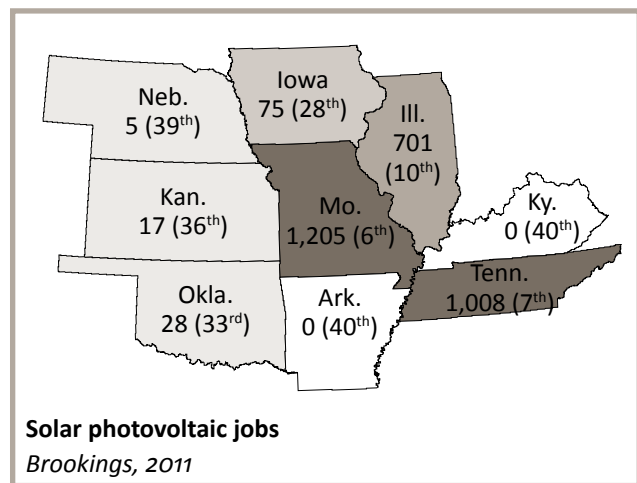
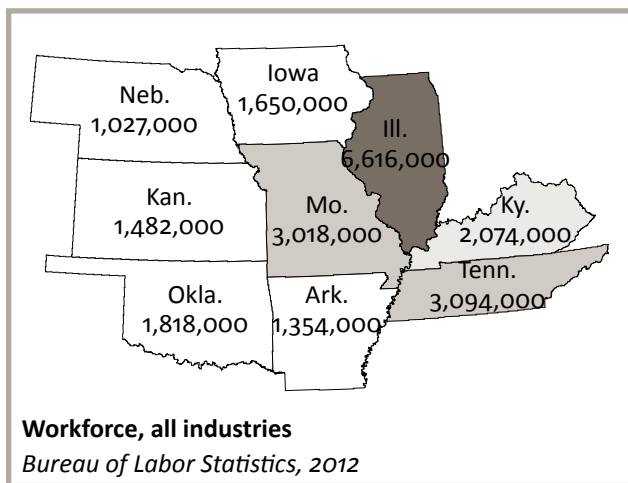
Waterways

- Missouri is ranked tenth for inland waterway mileage (1,000 miles), moving an average of \$4.1 billion in cargo annually.
- Twenty-nine industrial centers, with a combined population of 90 million, can be reached from St. Louis by barge. St. Louis is the northern-most 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*).
- Nearly 4,500 acres are available for development adjacent to Missouri's port authorities.



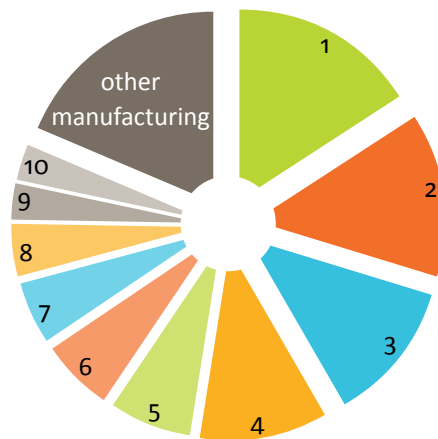
4 Missouri's got talent!

- Access to skilled labor means higher productivity, higher quality of product, and higher profits. With a workforce of more than 3 million, Missouri counts its people among its greatest resources.
- Education and training enhance our worker profile with 138 degree granting institutions statewide (*National Center for Education Statistics, 2010*).
- Missouri's labor force alone exceeds the entire populations of 20 states, including neighboring Kansas, Arkansas, and Nebraska (*Census Bureau, 2011*).
- Missouri ranked 6th for solar photovoltaic jobs in 2010, and 8th for growth of solar thermal jobs from 2003–2010, according to the Brookings Clean Economy Jobs Report.



- Food products: 39,748
- Transportation equipment: 34,327
- Fabricated metals: 29,347
- Machinery: 26,651
- Chemicals: 17,544
- Plastics/Rubber: 14,811
- Printing: 12,998
- Electrical equipment: 11,190
- Nonmetallic mineral manufacturing: 7,652
- Miscellaneous: 7,478

Missouri's top manufacturing sectors by employment
BLS, Quarterly Census of Employment and Wages, 2012, prelim.



Occupation information for solar energy

Bureau of Labor Statistics, May 2012

Occupation code	Occupation title	Missouri employment	Missouri median hourly wage	United States median hourly wage
00-0000	All Occupations	2,605,910	\$15.21	\$16.71
17-0000	Architecture and Engineering Occupations	34,920	\$32.87	\$35.35
17-2041	Chemical Engineers	430	\$42.08	\$45.36
17-2071	Electrical Engineers	3,280	\$41.79	\$42.27
17-2081	Environmental Engineers	690	\$32.94	\$38.89
17-2141	Mechanical Engineers	3,530	\$36.61	\$38.74
17-3023	Electrical and Electronics Engineering Technicians	1,600	\$27.45	\$27.81
17-3024	Electro-Mechanical Technicians	200	\$14.84	\$24.91
17-3027	Mechanical Engineering Technicians	490	\$23.22	\$24.99
51-0000	Production Occupations	188,170	\$14.31	\$14.87
51-1011	First-Line Supervisors of Production and Operating Workers	11,650	\$23.33	\$25.98
51-2022	Electrical and Electronic Equipment Assemblers	3,100	\$13.56	\$13.85
51-2092	Team Assemblers	27,600	\$13.22	\$13.29
51-4041	Machinists	5,870	\$18.10	\$18.99

Education programs

Educational programs in alternative energy have garnered national attention for Missouri.

Crowder College

- Crowder College in Neosho is known for its programs in alternative energy, including an AA and AAS degrees in Alternative Energy-Solar and an AS in Pre-Engineering with an Alternative Energy Option. Crowder also offers an Active Solar Technician Certificate. ([more](#))
- 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.

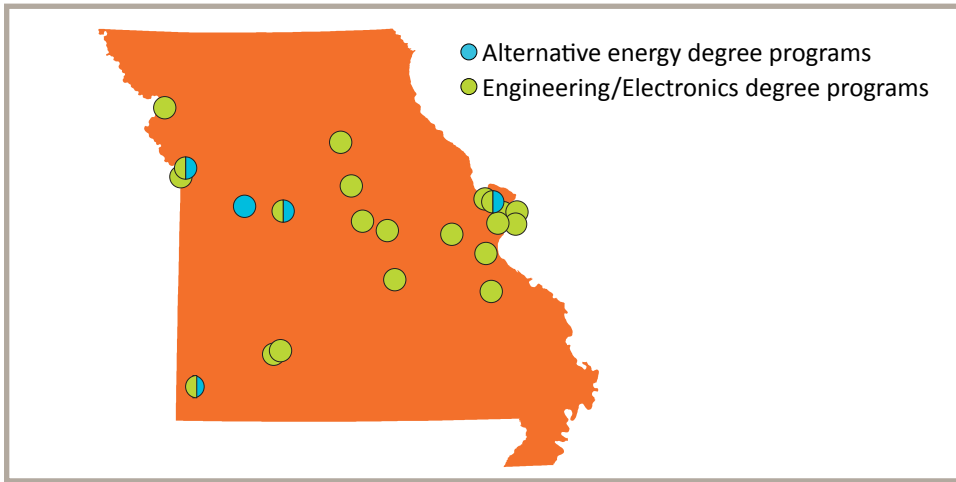
Metropolitan Community College

- 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 also prepares students for the NABCEP Entry Level PV Installer Exam. ([more](#))
- MCC also offers a 43 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. ([more](#))

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. ([more](#))
- The Evergreen Institute's Center for Renewable Energy and Green Building in Gerald, Mo. offers quality hands-on workshops in solar electricity (photovoltaics), 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. ([more](#))
- Microgrid Solar currently teaches a North American Board of Certified Energy Practitioners (NABCEP) Installer test prep course for St. Louis Community College. ([more](#))
- Ozarks Technical Community College's Center for Workforce Development offers courses in Solar Photovoltaic Design and Renewable Energy Basics. ([more](#))
- The University of Central Missouri in Lee's Summit offers a degree program in chemistry with focus on alternative energy, environmental, and entrepreneurship. ([more](#))
- 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. ([more](#))

Alternative energy degree programs



2-year programs

- Crowder College: Associate of Art in Alternative Energy with Solar Emphasis.
- Metropolitan Community College: Photovoltaics Certificate; Energy Efficiency Certificate.
- State Fair Community College: Associate of Applied Science in Renewable Energy.

4-year programs

- University of Central Missouri: BS in Chemistry- Emphasis in Alternative Energy.

Engineering/Electronics degree programs

- Missouri post-secondary educational institutions granted over 4,000 Engineering and Engineering Technology degrees in 2012 (*IPEDS*).

2-year programs

- Crowder College: Associate of Science in Pre-Engineering.
- East Central College: Associate of Science in Pre-Engineering.
- Jefferson College: Associate in Applied Science in Electronics Technology.
- Lincoln University: Associate of Science in Pre-Engineering.
- Linn State Technical College: Associate in Applied Science in Electronics Engineering Technology.
- Metropolitan Community College: Associate in Engineering; Associate in Applied Science in Engineering Technology.
- Mineral Area College: Associate in Applied Science in Electrical/Electronics Technology.
- Missouri Tech: Associate in Applied Sciences in Electronics Engineering.
- Missouri Western State University: Associate of Science in Electronics Engineering Technology.
- Moberly Area Community College: Associate of Science in Pre-Engineering.
- Ozarks Technical Community College: Associate of Science in Engineering.
- St. Charles Community College: Associate of Science in Pre-Engineering.

- St. Louis Community College: Associate in Applied Science in Electrical Engineering Tech. Associate in Science in Engineering Science.
- State Fair Community College: Associate of Applied Science in Industrial Technology-Emphasis in Electrical Maintenance.

4-year programs

- Missouri Tech: . BS in Electronics Engineering.
- Missouri State University: BS in Electrical Engineering; MS in Materials Science.
- Missouri S&T: BS in Chemical Engineering, Electrical Engineering, Environmental Engineering, and Mechanical Engineering; MS in Chemical Engineering, Electrical Engineering, Mechanical Engineering, Environmental Engineering, and Materials Science & Engineering; PhD in Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Materials Science & Engineering.
- Saint Louis University: BS in Electrical Engineering and Mechanical Engineering.
- University of Missouri: BS in Chemical Engineering, Electrical Engineering, and Mechanical Engineering; MS in Chemical Engineering, Electrical Engineering, and Mechanical & Aerospace Engineering; PhD in Chemical Engineering, Electrical & Computer Engineering, and Mechanical & Aerospace Engineering.
- University of Missouri-Kansas City: BS in Electrical & Computer Engineering and Mechanical Engineering; MS in Electrical Engineering, Chemical Engineering, and Mechanical Engineering.
- University of Missouri-St. Louis (Joint program with Washington University): BS in Electrical and Mechanical Engineering.
- Washington University in St. Louis: BS in Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Systems Science Engineering; MS in Energy, Environmental & Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Systems Science Engineering; PhD in Energy, Environmental & Chemical Engineering, Electrical Engineering, and Mechanical Engineering.

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

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. ([more](#))

Missouri University of Science & Technology (S&T)

- Missouri S&T finished first in solar car competitions Sunrayce (1999) and North American Solar Challenge (2003). ([more](#))
- S&T has also participated in four U.S. Department of Energy Solar Decathelons in Washington, D.C., partnering with the University of Missouri. S&T will compete in the 2013 Decathlon with the Chameleon House that adapts to its environment. ([more](#))
- Solar houses built for past DOE Solar Decathelons now make up S&T's Solar Village, which also recently became home to an experimental microgrid project. The houses are leased to students or faculty committed to living a sustainable lifestyle. ([more](#))
- The Office of Sustainable Energy and Environmental Engagement (OSE3) at Missouri S&T fosters strategic alliances to support environmental and campus sustainability. ([more](#))
- 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. ([more](#))
- 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. ([more](#))

University of Central Missouri

- UCM's Center for Alternative Fuels and Environmental Science in Warrensburg is teaching students to build solar-powered vehicles that cost less than similar projects across the nation. ([more](#))

University of Missouri

- The University of Missouri is home to the Center for Sustainable Energy in Columbia, Missouri which supports and coordinates research, education and commercialization of renewable energy sources.
- 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. ([more](#))

Washington University in St. Louis

- Washington University has the country's only department of Energy, Environmental, and Chemical Engineering. ([more](#))
- 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. ([more](#))
- The Photosynthetic Antenna Research Center (PARC) at Washington University aims to understand the basic scientific principles that govern solar energy collection by photosynthetic organisms. PARC plans to use this knowledge to enhance natural antenna systems and to fabricate biohybrid and bioinspired systems for light-harvesting. ([more](#))
- Washington University in St. Louis 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.

The Missouri Partnership is a public-private, non-profit focused on recruiting new business to the state. To find out how Missouri Partnership can assist at any stage of your project, 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

website: www.missouripartnership.com

social media:

