



**CHANNELING  
ENERGY RESOURCES  
AND TECHNOLOGY  
TO SERVE GLOBAL  
INDUSTRIES AND  
WORLDWIDE  
POPULATIONS  
IN WISCONSIN.**

# WHY ENERGY, POWER AND CONTROL COMPANIES CHOOSE WISCONSIN

Wisconsin is a global center in energy, power and control—uniquely leveraging market-leading industrial capabilities, advanced academic research and specialized institutions. Electrical machinery and controls manufacturing is Wisconsin's fastest growing and most competitive industrial sector, and companies in this sector are committed to addressing the world's energy challenges by continuously adapting to new market demand and opportunities. From fossil fuels to biofuels, wind and solar technologies, Wisconsin is generating new ideas, new advanced applications and new energy efficiency technologies to power the world.

## INDUSTRY ADVANTAGES

More than 900 companies in Wisconsin's growing energy, power and control sector employ over 100,000 people and generate \$38 billion in annual sales. Showing 31.1 percent growth from 2008 to 2011 and export growth topping 18.73 percent from 2010 to 2011—compared to a national rate of 12.27 percent—Wisconsin's electrical equipment manufacturing subsector stands as the largest and most competitive driver industry in the state.

**900**   
COMPANIES

**100,000**   
EMPLOYED

**\$38<sup>B</sup>**   
ANNUAL SALES

Source: Midwest Energy Research Consortium.



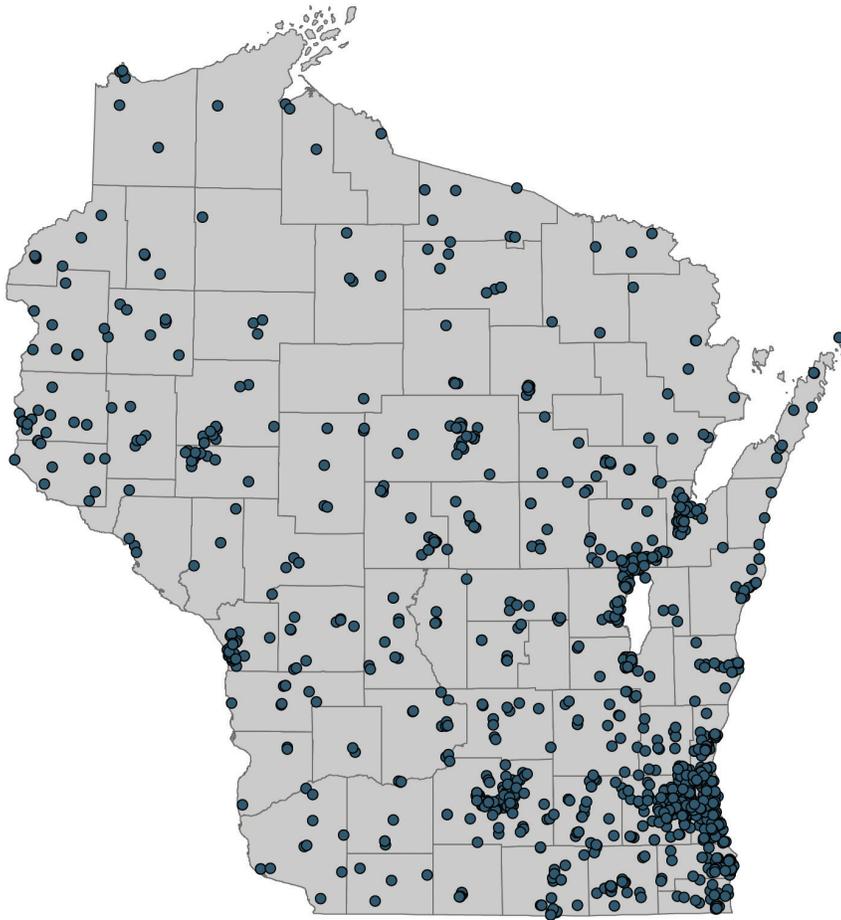
Source: Global Trade Atlas

Underscoring Wisconsin's industry leadership is the variety of companies fulfilling the specific demands of the energy continuum:

- **ENERGY** — conservation, fossil fuels, nuclear, renewable, and storage.
- **POWER** — transmission, distribution, monitoring, efficiency, quality
- **CONTROL** — industrial automation, building automation, energy management, SMART grid/distributed energy resource system, wind and solar control



Even with utilities comprising a significant portion of the state's energy industry representation, Wisconsin's capabilities are broad and widely disbursed and reflect particular strength in the areas of generation and transmission; storage and distribution; conversion, control, and automation; and efficiency and conservation.



Map created by Midwest Energy Research Consortium (2013)

Notable companies in energy, power and control include:

- ABB
- American Superconductor
- Briggs & Stratton
- Cooper Power Systems
- Danfoss
- DRS Power & Control Technologies, Inc.
- Eaton
- Fairbanks Morse
- Generac Power Systems
- GE Waukesha Motors
- Ingeteam
- Johnson Controls
- Kohler Company
- Orion Energy Systems
- Plexus Corp.
- Regal-Beloit Corp.
- Rexnord Industries
- Rockwell Automation
- Trane
- ZBB Energy

## WISCONSIN ENERGY INSTITUTE

The Wisconsin Energy Institute (WEI), which opened in May 2013, is the catalytic home of energy research at the University of Wisconsin-Madison. The Institute, built with recyclable materials and designed to adapt to changes in technology and research for the next 100 years, houses multiple departments and is the focal point for renewable and clean energy research, training and technology transfer at the University.

The Institute includes:

- 110,000 square feet (220,000 square feet once completed)
- Five floors of research labs, translational labs, office and meeting space, outreach and education space, and collaborative work spaces, including two video-conferencing rooms
- A high-bay lab for distributed energy resource system research which can be scaled up for application and usage tests
- A distributed energy resource system emulator
- "Plug and play" wet and dry labs



With a markedly high concentration of engineers in the state’s Southeast region, Wisconsin also possesses the quality and quantity of necessary talent to compete on a global scale. Wisconsin’s stellar academic institutions offer certificates and associate’s, bachelor’s, master’s and doctoral degrees in a variety of fields ranging from solar energy technology to engineering mechanics. In 2012, the electrical engineering and electromechanical engineering programs across the state stood out as some of the most successful, with 481 and 135 educational completions, respectively. This highly educated workforce is the foundation for a thriving energy sector in Wisconsin.<sup>1</sup>

OCCUPATION TITLE	TOTAL JOBS	LOCATION QUOTIENT <sup>2</sup>
Industrial Production Managers	5,500	1.67
Electrical Engineers	3,030	0.92
Industrial Engineers	6,670	1.48
Mechanical Engineers	6,440	1.24
Electrical and Electronics Engineering Technicians	2,490	0.84
Electro-Mechanical Technicians	470	1.35
Industrial Engineering Technicians	2,290	1.66
Mechanical Engineering Technicians	1,080	1.13
First-Line Supervisors of Production and Operating Workers	17,730	1.52
Electrical and Electronic Equipment Assemblers	7,290	1.80
Electromechanical Equipment Assemblers	2,810	2.74

Source: Bureau of Labor Statistics, Occupational Employment Statistics, May 2012

## GLOBAL LEADERSHIP

Public-private partnerships in Wisconsin draw together educational institutions, industry participants and government agencies to create a collaborative model that draws upon some of the world’s leading experts in energy, power and control.



The **MIDWEST ENERGY RESEARCH CONSORTIUM (M-WERC)**, a consortium of businesses and institutions spanning eight Midwestern states, was originally created to connect industry representatives with research resources within Wisconsin’s university system. Since its founding in 2009, M-WERC has expanded to become a regional model for energy collaboration in the United States. As one of the country’s largest consortia of energy companies, research institutions and other discerning stakeholders, M-WERC sparks opportunities for business development for its members throughout the Midwest.

[1] Educational completions were derived by adding CIP codes 14.1001 and 15.0303 to obtain 481 completions in electrical engineering. CIP code 15.0403 was used to derive the 135 completions for electromechanical engineering.

[2] Location Quotient is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. Location Quotients greater than 1 indicate a specialization, expertise, and strength of numbers for the particular subject.

M-WERC members benefit from the collaboration that results from the organization's research ties to nine of Wisconsin's premier academic institutions. Participating businesses are able to tap the expertise of leading industry researchers as they seek innovative, cost effective and efficient energy solutions, including distributed energy resource systems.



**ENERGY ADVANCEMENT CENTER** - Johnson Controls and the University of Wisconsin-Milwaukee (UWM) have partnered to build the Energy Advancement Center on the UWM campus. The Center contains the largest "dry lab" in an academic institution in North America. In addition, the Center's shared endowed professorship with the UW-Madison creates an unprecedented partnership between the global leader in automotive batteries and the UW System's research institutions. This partnership allows Johnson Controls to work directly with scientists on cutting-edge research to develop new technologies in energy storage and auto battery technology while also grooming the next generation of talented engineering students.



The **GREAT LAKES BIOENERGY RESEARCH CENTER (GLBRC)**, a public-private collaboration led by the UW-Madison in partnership with Michigan State University, performs the basic research that generates technology to convert cellulosic biomass to ethanol and other advanced biofuels. With over 400 scientists, students and staff, the Center strives to meet the nation's need for a comprehensive suite of clean energy technologies. Some of GLBRC's most notable achievements include:

- U.S. Patent protecting a technique of breaking down cellulosic biomass into biofuel
- Hyrax Energy, a spinout from the center
- 65 patent applications
- 72 invention disclosures
- 26 options / licenses under negotiation

The Center's impressive results resulted in the renewal of a U.S. Department of Energy Science, Biological and Environmental Research Grant for \$25 million per year over the next five years.



A one-of-a-kind and proven program promoting sustainability best practices in Energy/Electrical Efficiency and Manufacturing, the **PROFITABLE SUSTAINABILITY INITIATIVE (PSI)** administered by the Wisconsin Manufacturing Extension Partnership (WMEP) helps small- to mid-size manufacturers in Wisconsin maximize their sustainability practices toward

## RENEWABLE ENERGY DEVELOPMENT, UNIQUE ASSETS AND CAPABILITIES

### BIOFUEL

Wisconsin leads the nation in anaerobic digesters with over 30 digesters throughout the state—more than any other state in the nation. This and other industry assets have attracted global interest to the state, including a delegation of biogas industry representatives from 12 European companies who visited Wisconsin in 2011 to explore North American expansion opportunities (Goetch). Attention for Wisconsin biofuel companies is well deserved, due in large part to the innovative breakthroughs across the state:

- Rosendale Dairy is the largest dairy farm in Wisconsin and one of the state's leaders in biofuel production with a large anaerobic digester currently in operation and another planned \$7-million digester, for which the company broke ground in July 2013. The new biodigester, which will be UW-Oshkosh's largest biodigester, will produce nearly 1.4 megawatts of electricity by processing approximately 240 tons of separated solids per day. The farm facility will also house a public education center and off-campus laboratory to provide biofuel education for students in the surrounding region.
- Virent, located in Madison, Wisconsin, is the first company in the nation to develop a technique of converting non-food material such as pine chips and corn stalks into fuel.



greatest profit. Through PSI's diagnostic and implementation processes, Wisconsin manufacturers work with energy, environmental, logistical, lean and financial experts in order to dramatically decrease energy intensity while increasing energy and resource efficiency to grow their businesses.

Wisconsin companies are reaping benefits with a return on investment of 25:1. Over the past two years, PSI has helped improve the performance of more than 125 businesses and has had an aggregate economic impact of \$52.7 million statewide.



The City of Milwaukee's **OFFICE OF ENVIRONMENTAL SUSTAINABILITY (OES)** promotes cost-effective environmental sustainability practices in order to improve resource efficiency for not only the city, but also for businesses. Since 2006, OES attracted over \$20 million in grant funding to support a multitude of projects and initiatives to improve energy efficiency:

- Milwaukee Energy Efficiency Program (ME<sup>2</sup>) – Provides affordable financing to City of Milwaukee homeowners and businesses for energy efficiency improvements, so they can pay for energy saving building improvements as they save on their energy bills. To date, the program has upgraded over 1,250 homes and over 130 businesses, stimulating more than \$24 million in energy efficiency upgrades since 2011. Going forward, the City of Milwaukee offers Property Assessed Clean Energy (PACE) financing to help commercial building owners to afford improvements.
- Milwaukee Shines Program – Makes solar a reality for residents and businesses through education, training and creative financial solutions such as group buy programs and an innovative private financing program. Since the program's inception in 2009, solar installations have increased five-fold with consistent decline in cost.
- Milwaukee Sustainable Manufacturing Program (ME3) – Provides incentives and leverages technical assistance to identify cost-effective practices and projects that help firms increase material and resource efficiency; cut energy costs and water use; and decrease waste.

## CUTTING-EDGE ACADEMIC PROGRAMS AND INDUSTRY-ACADEMIC COLLABORATIONS

Wisconsin's long history of collaboration between business and academia has yielded innovations that have advanced industry not only nationally, but globally.

### UNIQUE ACADEMIC ASSETS

- The Great Lakes Bioenergy Research Center, led by UW-Madison, stands as one of three bioenergy research centers established by the U.S. Department of Energy.

## RENEWABLE ENERGY DEVELOPMENT, UNIQUE ASSETS AND CAPABILITIES

### WIND

- More than 171 Wisconsin wind power supply chain companies are re-tooling to supply the growing markets for renewable energy equipment (The Environmental Law and Policy Center).
- In 2013, the American Wind Energy Association ranked Wisconsin 18th in total installed wind capacity and 16th in the Nation on their list of states with the most wind energy potential (American Wind Energy Association).
- The U.S. Department of Energy's 2012 Wind Technologies Market Report ranked Wisconsin third nationally with 648 megawatts of installed total wind power capacity at the end of 2012. The study also ranks Wisconsin as the third fastest-growing state for distributed wind.
- Wisconsin Wind Works

The state is home to Wisconsin Wind Works. A collaborative initiative driven by New North, Inc., Wisconsin Wind Works is a consortium of suppliers and vendors with over 300 member companies covering 16 product and service categories. Participating companies work together to create a strong and comprehensive domestic supply chain for buyers across the globe.



- UW–Madison is also home to Robert Lasseter, Ph.D., one of the lead researchers in distributed energy resource system technology (DERS).
- UW–Madison is one of the founding institutions of the Power Systems Engineering Research Center (PSERC). PSERC’s Executive Director, Professor Dennis Rey, has helped to maintain UW–Madison PSERC as one of the nation’s hot beds of Electrical Transmission and Distribution research.
- UW–Madison is home to Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC), the largest global advanced power conversion consortium having over 85 company members.
- Milwaukee School of Engineering’s Fluid Power Institute, a 2,400 sq. ft. laboratory, provides research space to hydraulic companies such as John Deere and Caterpillar.
- UW–Stevens Point’s Wisconsin Institute for Sustainable Technology (WIST) provides research, education and services to improve Wisconsin’s long-term environment and economy through collaboration of educators, students and researchers.
- UW–Platteville’s Sustainable and Renewable Energy Systems Program, a university-wide interdisciplinary program, enhances student knowledge of all energy sources and their impacts on the environment and society.

## POWERFUL PARTNERSHIPS

- UW–Madison and Johnson Controls have teamed up to build an energy storage research lab in the newly built Wisconsin Energy Institute to support education, outreach, and research advances in battery storage technology.
- UW–Oshkosh and Rosendale Dairy are collaborating on a \$7 million biogas production facility which will provide enough renewable energy to power approximately 1,200 homes. The facility will also serve as a public education center for K-12 students as well as remote classrooms for UW–Oshkosh students in order to promote new waves of environmental and renewable energy scientists in the area.

## WHY WISCONSIN?

Centrally located in the United States’ leading manufacturing and agricultural region, Wisconsin is one of the best places for business. Generations of business leaders have recognized the advantages our major ports provide, giving them quick access to markets throughout the country and around the world. Plus, our transportation infrastructure allows distribution of goods and services rapidly, reaching many markets within one day.

Beyond location, Wisconsin’s highly skilled workforce has been recognized around the world for its industrious, Midwestern work ethic. We enjoy a high quality of life with one of the lowest cost-of-living indices in the country. And businesses located in Wisconsin face a very low risk of natural disasters—decreasing the risk of downtime and reduced productivity.

It’s not just the people and ports that strengthen Wisconsin. Our business climate is attractive to companies looking to expand, relocate or establish North American operations. Our initiatives and policies are boosting our economy and creating an environment where businesses succeed. In addition, we offer a highly integrated, responsive network of public and private organizations ready to assist companies interested in Wisconsin.

## RENEWABLE ENERGY DEVELOPMENT, UNIQUE ASSETS AND CAPABILITIES

### SOLAR

- More than 140 solar companies in Wisconsin ranging from manufacturing to contracting to installation are helping to create and implement new technologies that draw upon the sun’s boundless energy (The Solar Foundation).
- Milwaukee and Madison were named two of the “25 Solar America Cities” by the U.S. Department of Energy, making Wisconsin one of three states in the country with two solar cities (Wisconsin Environment).
- Milwaukee Shines Program

Wisconsin has established itself as a national hub for solar thermal companies with the backing of the Milwaukee Shines Program. The leadership stemming from the program has led to Milwaukee hosting the annual Solar Thermal national conference both in 2011 and 2012. Some of the direct impacts of the program on the solar industry include:

- Wisconsin’s first searchable solar supply chain directory and map
- Milwaukee Power Pack—a solar purchase program designed to offer affordable, high-quality products from local professionals

## WORKS CITED

- American Wind Energy Association. Wind Energy Facts: Wisconsin. October 2012. Web. 10 July 2013. <<http://www.awea.org/learnabout/publications/factsheets/upload/3Q-12-Wisconsin.pdf>>.
- Clean Energy States Alliance. Wisconsin Opportunities for Offshore Wind Businesses. July 2013. 10 July 2013. <<http://www.cleanenergystates.org/assets/2013-Files/OSW/DW-OSW-State-Profiles/Wisconsinfinal.pdf>>.
- Forward Wisconsin. Wind Energy. July 2013. Web. 10 July 2013. <<http://forwardwi.org/sub165/Wind-Energy>>.
- Goetch, Andrew C., and Eggert, Thomas L., eds. 2012 Wisconsin New Technology Jobs Report. Wisconsin Sustainable Business Council, 2012. Print.
- Solar Energy Industries Association. State Solar Policy. July 2013. Web. 10 July 2013. <<http://www.seia.org/state-solar-policy/wisconsin>>.
- The Environmental Law and Policy Center. The Solar and Wind Energy Supply Chain in Wisconsin. October 2011. Web. 10 July 2013. <<http://elpc.org/wp-content/uploads/2011/10/ELPCWisconsinWindSolarReport.2011.pdf>>.
- The Solar Foundation. State Solar Jobs Wisconsin. July 2013. Web. 25 July 2013. <<http://thesolarfoundation.org/solarstates/wisconsin>>
- Wisconsin Environment. Go Solar, Wisconsin. July 2013. Web. 10 July 2013. <<http://www.wisconsinenvironment.org/programs/wie/go-solar-wisconsin>>.

