DRIVING WORLDWIDE INNOVATION IN ENERGY, POWER&CONTROL IN WISCONSIN®



WHY ENERGY, POWER CONTROL COMPANIES CHOOSE WISCONSIN

Companies looking to start, relocate or expand their operations in Wisconsin benefit from the state's central location, reliable infrastructure, talented workforce and business-friendly policies—all of which create competitive advantages that help businesses capitalize upon regional, national and global market opportunities.

Wisconsin's long history of innovation continues to fuel new solutions to challenges facing people, companies, nations and our very planet, with some of the most respected companies in the world drawing upon Wisconsin's plentiful natural resources, renowned research capabilities and the can-do spirit of its citizens to grow and succeed.



BY WISCONSIN ENERGY, POWER AND CONTROL COMPANIES

Source: QCEW Employees - EMSI 2017.3 Class of Worker, 2015



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. Wisconsin is a global center for energy, power and control uniquely leveraging market-leading industrial capabilities, advanced academic research and specialized institutions. Electrical machinery and control 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.



Source: Infogroup

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. Electrical machinery is Wisconsin's third-highest export category, totalling \$2 billion in 2016 (U.S. Census Bureau data as reported by WISERTrade).

With the brightest minds and latest technologies available, Wisconsin companies are leading the way all along the spectrum of energy, power and control, with a broad and deep array of companies representing all the areas the sector encompasses:

ENERGY — conservation, fossil fuels, nuclear, renewables and storage

POWER — transmission, distribution, monitoring, efficiency and quality

CONTROLS — industrial automation, building automation, energy management, SMART grid/distributed energy resource system, wind and solar control

Although utilities make up a significant portion of Wisconsin's energy industry representation, the state's capabilities are broad and widely dispersed, and reflect special strength in the areas of:

- generation and transmission;
- storage and distribution;
- conversion, control, and automation; and
- efficiency and conservation.

Notable companies in energy, power and control include:

ABB Inc. (New Berlin and Wauwatosa) Briggs & Stratton (Wauwatosa) Cooper Power Systems (Waukesha) Danfoss (Milwaukee) DRS Power & Control Technologies, Inc. (Milwaukee) Eaton (Menomonee Falls) EnSync Energy Systems (Menomonee Falls) Fairbanks Morse (Beloit) Generac Power Systems (multiple locations) Ingeteam (Milwaukee) Johnson Controls (Milwaukee) Kohler Company (Kohler) **Orion Energy Systems** (Manitowoc) Plexus Corp. (Neenah) Regal Beloit Corp. (Beloit) **Rexnord Industries** (Milwaukee) Rockwell Automation (Milwaukee) S&C Electric Co. (Franklin)

Trane (La Crosse)



Wisconsin is well known for its industrious, Midwestern work ethic, and its educational system is universally admired. Wisconsin's high school graduation rate is consistently ranked among the top in the nation, and the University of Wisconsin System is regularly cited as a leader in terms of size and quality.

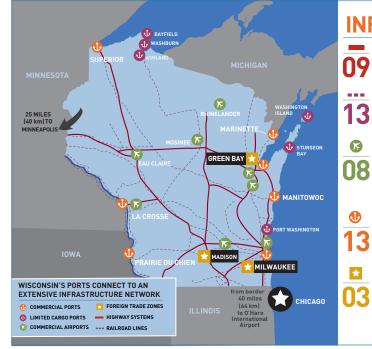
Wisconsin's public and private colleges support the resources, companies and policy makers throughout the state that are working to develop new, innovative products to fulfill market needs. And as the first state in the nation to develop a technical college system, Wisconsin has more than 100 years' experience training its workforce to fulfill ever-changing industry demands.

With a markedly high concentration of engineers in the state's southeast region, Wisconsin possesses the quality and quantity of necessary talent to compete on a global scale. Wisconsin's stellar academic institutions offer certificates and associate, bachelor's, master's and doctoral degrees in a variety of fields ranging from solar energy technology to engineering mechanics. In 2016, the mechanical engineering and electrical engineering programs across the state stood out as some of the most successful, with 816 and 586 educational completions, respectively.¹ This highly educated workforce is the foundation for a thriving energy sector in Wisconsin.

INFRASTRUCTURE

Wisconsin's central location and robust infrastructure give companies operating in the state one-day access to major markets throughout the U.S. and beyond. Wisconsin's roads, railways and ports provide seamless, convenient access to the world's busiest multimodal transportation hub, located just 55 miles south of the state's border.

¹ Educational completions were derived by adding CIP codes 14.19 and 15.08 to obtain 816 completions in mechanical engineering. CIP codes 14.10 and 15.03 were used to derive the 586 completions for electrical engineering. National Center for Education Statistics, IPEDS Database 2016



INFRASTRUCTURE IN WISCONSIN

HIGHWAY SYSTEMS

State commerce and industry relies on nine major highways covering more than 11,800 miles (18,990 km) to move our goods to market. Our interstate system connects us to major industrial cities across the U.S.

RAILROAD LINES

Rail traffic throughout the state continues to grow and move more than \$122 billion in freight each year, creating a seamless link in the nationwide intermodal system. Amtrak travels between Chicago and Milwaukee multiple times daily.

COMMERCIAL AIRPORTS

Eight commercial airport locations serving major industrial and metropolitan areas
statewide. These airports are served by all major carriers, linking to every point in the nation
within one business day. In addition, these larger airports are within driving distance:

CHICAGO: O'Hare is American's second largest hub, with 963 domestic flights daily to 153 U.S. cities and more than 100 direct flights daily to 55 international destinations. MINNEAPOLIS: 135 nonstop flights including 115 domestic and 20 international markets.

COMMERCIAL PORTS

Uniquely situated on the nation's greatest waterways, Wisconsin ships 39 million ton of product from commercial cargo ports and 6 limited cargo ports located along Lake Michigan, Lake Superior and the Mississippi River.

FOREIGN TRADE ZONES (FTZ)

Companies located in one of our three Foreign Trade Zones (FTZs) can import merchandise (by truck, rail, air or boat) without going through formal customs entry procedures or paying import duties. These companies have the option to pay tariffs after their product inventory is sold, improving cash flow and saving money. Other benefits include, but are not limited to: global market competitiveness, minimized bureaucratic regulations, and improved supply chain efficiencies.

WISCONSIN ENERGY INSTITUTE



Wisconsin Energy Institute UNIVERSITY OF WISCONSIN-MADISON

The Wisconsin Energy Institute (WEI), which opened in May 2013, is the catalytic home of energy research, training and technology at the University of Wisconsin-Madison, one of the nation's top-five research institutions. WEI supports the energy research of more than 100 faculty and scientists working across disciplines to solve large-scale energy challenges. The institute is committed to developing a smarter, cleaner energy portfolio that can advance economic growth for the state and the nation, and to creating real-world innovations that offer new competitive advantages and products for a wide range of Wisconsin industries.

The institute's research falls into two distinct categories:

Electricity systems: by coupling carbon-neutral technologies with energy storage solutions, WEI experts are configuring renewable systems that could support a smarter energy grid.

Fuels and transportation: A focus on converting non-food crops into next generation and drop-in fuels, and developing a robust pipeline from biomass production to biofuels and biochemical.

In addition, scientists at the Engine Research Center focus on combustion performance and pollutant emissions. The institute was built with recyclable materials and designed to adapt to changes in technology and research for the next 100 years. Two principles guide all the work WEI does: preparing UW-Madison students for future leadership in the energy, power and control sector; and engaging with industry in high-impact research collaborations.





ENERGY INNOVATION CENTER

With Wisconsin's strength in energy, power and control, a collaborative space was envisioned for entrepreneurs, researchers, scientists, engineers and business leaders to come together and reap the benefits of physical proximity and interaction. The Energy Innovation Center in Milwaukee's 30th Street Industrial Corridor provides just such a space. Now in the second phase of its build-out, the center already serves as a space for conducting joint research, jump-starting innovative technologies, transitioning prototype products to the commercial stage and nurturing startups.

The center includes shared lab space for collaborative research, an advanced prototyping center and a large-scale product piloting space. The Midwest Energy Research Consortium (M-WERC), which operates the center, will also offer an IP Exchange to allow member companies to easily monitor and view the publicly available details of other member companies' research.

The center plays a critical role in furthering the development of the Midwest region as a global hub for energy, power and control, and its presence is transforming a Milwaukee neighborhood as businesses in the sector and other supporting businesses relocate there.



By accelerating innovation in this rapidly growing global market through regional collaboration, the Energy Innovation Center will energize new and existing businesses.

> Mike Laszkiewicz, Rockwell Automation Vice President & General Manager

RENEWABLE ENERGY ASSETS AND CAPABILITIES

BIOFUELS

Wisconsin has more than 170 biogas facilities in all—81 at municipal wastewater treatment plants, 36 at dairy farms, 34 at landfills and 21 at industrial food and fuel processors. Of these, landfills have the highest capacity to generate electricity (92.1 MW), followed by dairy farms (24.6 MW), municipal wastewater treatment plants (14.5 MW) and industrial food and fuel processors (10.0 MW) (State Energy Office, 2015). This and other industry assets have attracted global interest to the state. Attention for Wisconsin biofuel companies is well deserved, due to innovative breakthroughs including:

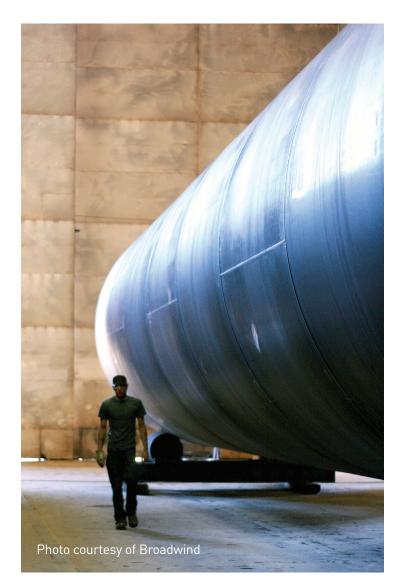
- Rosendale Dairy is the largest dairy farm in Wisconsin and one of the state's leaders in biofuel production. Its new biodigester produces over 1.4 MW of electricity by processing approximately 240 tons of separated solids per day. The project, a partnership with UW-Oshkosh, received the Biogas Project of the Year award from the American Biogas Council in 2015 for its use of manure to provide clean electricity, heat, organic soil amendments and hands-on learning opportunities for students. Around 1,100 homes are powered by this renewable energy production, which offsets the release of about 45,000 tons of CO2 annually.
- Madison-based Virent 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. In addition to providing fuel with a renewable source, this technology reduces the use of plastics, packaging and transportation fuels. Virent has forged notable partnerships with large companies including Coca-Cola, Shell and Cargill. The company was named #1 in the 40 Hottest Small Companies rankings by *BioFuels Digest* in 2015.

SOLAR

- More than 130 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, 2017).
- Renew Wisconsin (www.renewwisconsin.org) maintains listings of annual award recipients for community solar projects, noteworthy solar collaborations and the largest renewable energy installations.

WIND

- More than 230 Wisconsin wind power supply chain companies are retooling to supply the growing markets for renewable energy equipment (The Environmental Law and Policy Center).
- In 2016, Wisconsin ranked 25th among states in terms of total installed wind capacity (American Wind Energy Association). Wisconsin was ranked 16th among states with the most wind energy potential (American Wind Energy Association, 2013).
- 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. Participating companies work together to create a strong and comprehensive domestic supply chain for buyers across the globe.



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

MILWAUKEE ENERGY EFFICIENCY PROGRAM (ME2)

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 1,300 homes and 130 businesses, stimulating more than \$24 million in energy efficiency upgrades since 2011. The City of Milwaukee offers a Property Assessed Clean Energy (PACE) financing program to help commercial building owners finance energy-saving improvements through a voluntary municipal special charge. This open-market PACE program has been selected as a national implementation model by the U.S. Department of Energy. To date, the program has helped finance more than \$4 million in energy efficiency improvements.

MILWAUKEE SHINES, the City of Milwaukee's solar program, works to expand solar energy use through a comprehensive, citywide approach. Milwaukee Shines helps create cleaner air and reduce energy costs for the city and the community at large. Milwaukee Shines works with community partners to build a clean energy future. Past projects have been funded through the U.S. Department of Energy Solar America Communities and SunShot programs. When Milwaukee Shines formed in 2008, the City of Milwaukee was named one of 25 Solar America Cities by the U.S. Department of Energy, and earned the distinction again in 2009. Since then, Milwaukee has streamlined the permitting process, created a solar zoning ordinance and begun providing financing resources for home and business owners. In addition, there are more than 1.5 MW of solar energy being produced in Milwaukee, which has exceeded the goal of 1 MW of solar capacity.



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.



The MID-WEST 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. 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.



PROFITABLE SUSTAINABILITY INITIATIVE

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, helps small and midsize manufacturers in Wisconsin maximize their sustainability practices toward maximum 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 50:1. Over the past six years, PSI has helped improve the performance of more than 200 manufacturers, and has had an aggregate economic impact of \$305 million statewide. As a result of their participation, companies have reduced electrical consumption by an estimated 15.4 kilowatt hours annually, water use by 39 million gallons annually, and solid waste by 18 million pounds annually.





Broadwind Energy makes towers for wind turbines at its facility in Manitowoc, Wisconsin. Access to a deepwater port allows for transportation by water.

ENERGY, POWER AND CONTROL JOBS IN WISCONSIN

OCCUPATION TITLE	JOBS	LOCATION QUOTIENT
First-line supervisors of production and operating workers	22,580	1.85
Mechanical engineers	10,290	1.80
Electrical and electronic equipment assemblers	9,980	2.28
Industrial engineers	8,330	1.63
Industrial production managers	6,720	2.00
Electrical engineers	3,850	1.05
Electromechanical equipment assemblers	2,250	2.47
Electrical and electronics engineering technicians	2,070	0.77
Mechanical engineering technicians	2,000	2.20
Industrial engineering technicians	1,690	1.34

Bureau of Labor Statistics, Occupational Employment Statistics, May 2016

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.

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.

UW-Madison is also home to Robert Lasseter, Ph.D., one of the lead researchers in distributed energy resource system technology (DERS).

UW-Madison was one of the founding institutions of the **POWER SYSTEMS ENGINEERING RESEARCH CENTER** (PSERC). The UW-Madison PSERC remains one of the nation's hotbeds of electrical transmission and distribution research, and Grainger Professor of Power Engineering Christopher L. DeMarco serves as the site director.

UW-Madison is home to **WISCONSIN ELECTRIC MACHINES AND POWER ELECTRONICS CONSORTIUM**, an internationally renowned power electronics research group. With more than 80 corporate sponsors, the consortium's team of professors, graduate students and international scholars works together to research and develop the newest technologies and techniques in electric machines, power electronics, actuators, sensors, drives, motion control and drive applications.

UW-Milwaukee's **CENTER FOR SUSTAINABLE ELECTRICAL ENERGY SYSTEMS**, run by Adel Nasiri, Ph.D., includes a Power Electronics and Electric Drives Lab that focuses on all aspects of electrical energy generation and conversion. By integrating multiple energy conversion and storage devices, Dr. Nasiri and his team are able to design systems that provide the most effective, efficient and reliable means of providing power to loads. The goal of these research efforts is to develop technologies for multiple industries and build a talent pipeline for companies in southeastern Wisconsin and beyond. Milwaukee School of Engineering's **FLUID POWER INSTITUTE** is a leader in motion control and fluid power education, research and evaluation, and is distinguished as one of the nation's foremost academic fluid power research laboratories. The institute includes research laboratories both on campus and at a new space within the Chase Commerce Center on Milwaukee's south side. These laboratories' testing capabilities have earned the institute contracts with world-renowned corporations including Caterpillar, Sun Hydraulics, Parker Hannifin, CNH, John Deere and Exxon-Mobil. In addition, the institute frequently conducts evaluation and research projects for the National Science Foundation and the military.

UW-Stevens Point's WISCONSIN INSTITUTE FOR

SUSTAINABLE TECHNOLOGY 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.



Source: National IPEDS database published by the U.S. Department of Education's NCES





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.





ENERGY ADVANCEMENT CENTER - Johnson Controls and the University of Wisconsin-Milwaukee have partnered to build the Energy Advancement Center on the University of Wisconsin-Milwaukee campus. The center contains the largest "dry lab" in an academic institution in North America. In addition, the center's shared endowed professorship with 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.



GREAT LAKES BIOENERGY RESEARCH CENTER

(GLBRC), a federal-state collaboration led by UW-Madison in partnership with Michigan State University, performs the basic research that generates technology to convert non-food or cellulosic biomass to advanced biofuels and bio-based products. With over 400 scientists, students and staff, GLBRC strives to meet the nation's need for a comprehensive suite of clean energy technologies. Some of GLBRC's most notable achievements include:

- GlucanBio and Hyrax Energy, two early spinouts based on GLBRC technology
- 132 patent applications
- 122 invention disclosures
- 41 options/licenses under negotiation
- More than 800 publications reporting knowledge that will form the basis of using cellulosic biomass as a source of renewable fuels and products

GLBRC's impressive early results led to the U.S. Department of Energy's Office of Science, Biological and Environmental Research to renew the grant that provides \$265 million in total research support through 2017. This significant amount of federal funding has made GLBRC a center of expertise in bioenergy and bio-products and a source of innovation for Wisconsin industry.



Based in Mukwonago, Wisconsin, Gearbox Express rebuilds gearboxes for wind turbines.





Source: Center for Retirement Research at Boston College, 2016

WISCONSIN

JOHNSON CONTROLS

Milwaukee



Johnson Controls is a global diversified technology and industrial leader serving customers in more than 150 countries. Since inventing the first electric room thermostat in 1885, Johnson Controls has been committed to delivering innovative products that help the world run smoothly, smartly, simply and safely.

A Fortune 500 company with 120,000 employees in more than 1,500 locations across six continents, Johnson Controls specializes in building efficiency, with products, services and solutions to increase energy efficiency and lower operating costs for buildings worldwide; batteries and energy storage, including advanced batteries for hybrid and electric vehicles, as well as stationary energy storage; automotive seats that deliver superior quality and performance; and distributed energy storage that can be integrated into the energy control system of a utility, regional transmission organization or facility.

Johnson Controls' operational headquarters are in Milwaukee, Wisconsin, and global headquarters in Cork, Ireland.

ABB New Berlin and Wauwatosa



ABB is a pioneering technology leader with four global divisions that work closely with utility, industry, transport and infrastructure customers in roughly 100 countries. With more than four decades at the forefront of digital technologies, the company is a leader in digitally connected and enabled industrial equipment and systems, with an installed base of more than 70,000 control systems connecting 70 million devices.

ABB's Robotics and Motion Division employs more than 6,500 engineers, researchers and manufacturing personnel in the United States, including 340 at the Drives U.S corporate headquarters in Wauwatosa, Wisconsin, and 250 at the Drives U.S. plant in New Berlin, Wisconsin. Since 1981, ABB's Wisconsin factory has manufactured and assembled low- and medium-voltage drives for industry that can be found in applications within amusement parks, corporate offices, sports venues, breweries, bakeries and even the Statue of Liberty.

As the world's leading manufacturer of drives, ABB offers products, systems and service solutions that not only enhance its customers' businesses, but also lessen the environmental impacts through improved energy efficiency and increased industrial productivity.

ENERGY POWER CONTROL COMPANIES

BRIGGS & STRATTON

Milwaukee and Menomonee Falls

<image>

Briggs & Stratton Corporation [NYSE:BGG], headquartered in Milwaukee, Wisconsin, is focused on providing power to get work done and make people's lives better. Briggs & Stratton is the world's largest producer of gasoline engines for outdoor power equipment, and is a leading designer, manufacturer and marketer of power generation, pressure washers, lawn and garden, turf care and job site products through its Briggs & Stratton®, Simplicity®, Snapper®, Ferris®, Vanguard™, Allmand®, Billy Goat®, Murray®, Branco® and Victav brands. Briggs & Stratton products are designed, manufactured, marketed and serviced in over 100 countries on six continents. These products are sold through consumer home centers, department stores, mass merchants, warehouse clubs and independent dealers.

For over 109 years, Briggs & Stratton has seen innovation play a key role in both manufacturing processes and new product introductions. Research and development are a significant focus in the company's quest for user-driven problem solving. In today's competitive marketplace, investments in creating new product features and implementing unique solutions for customer challenges are paramount. That, coupled with innovations in manufacturing processes with robotics and new technologies, are essential to the company's growth.

REGAL BELOIT Beloit



Regal Beloit Corporation (NYSE: RBC) is a leading manufacturer of electric motors, electrical motion controls, power generation and power transmission products serving markets throughout the world. The company comprises three business segments: commercial and industrial systems, climate solutions and power transmission solutions.

Regal's product brands meet customer requirements in demanding applications used around the globe in heating, ventilation, air conditioning, commercial refrigeration, food processing, pharmaceutical, chemical processing, material handling, medical, oil and gas, construction, manufacturing, power generation, agriculture and mining.

Headquartered in Beloit, Wisconsin, Regal has manufacturing, sales and service facilities throughout the U.S., Canada, Latin America, Europe and Asia. With over 23,000 employees, Regal ranks in the Fortune 1,000 and is one of the largest electric motor manufacturers in the world. The Wisconsin Economic Development Corporation (WEDC) leads economic development efforts for the state by advancing and maximizing opportunities in Wisconsin for businesses, communities and people to thrive in a globally competitive environment. WEDC provides resources, operational support and financial assistance to companies, partners and communities in Wisconsin. WEDC achieves its mission through initiatives driven by five strategic pillars: business development; community and economic opportunity; strategic economic competitiveness; state brand management and promotion; and operational and fiscal excellence. Working with more than 600 regional and local partners, WEDC develops and delivers solutions representative of a highly responsive and coordinated economic development network.

Visit InWisconsin.com to learn more.



WISCONSIN ECONOMIC DEVELOPMENT CORPORATION

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