



WINDEMULLER RENEWABLE ENERGY

“Gamesa has had the opportunity to work with several different electrical contractors over the last few years. Windemuller’s willingness to heed advice and prepare for their site activities was a prime example of teamwork in the wind industry. The performance of you and your crew during installation of this G97 unit here in Garden, Michigan was well above exceptional and personally for Gamesa some of the best electrical work we have witnessed in our machines. Congratulations to you and your team for a job very well done. Gamesa looks forward to working with Windemuller again on the next 13 units and building a very successful site.”

– Frank Ingraham
Construction Manager
Gamesa Wind US
Garden, Michigan





ABOUT WINDEMULLER

Windemuller provides advanced technical and design services throughout Michigan and beyond. The family-owned company was established in 1954 as an electrical contractor, but has expanded into automation, communications and IT, electrical services, outdoor utilities, and renewable energy. From security systems for the government, to gauges and automated sensors for environmental cleanups, to responding to emergencies

on an industrial site, we are responsive and innovative. At its heart, Windemuller is about our people and the people we serve. We are more than 200 individuals strong and serve thousands of customers of all sizes within industrial, government, municipal, and commercial entities.

Windemuller has seven Michigan locations: Grand Rapids, Traverse City, Midland, Big Rapids, Whitehall, Petoskey and Kalamazoo.

AUTOMATION

- PLC and Database Programming
- HMI / SCADA Programming
- Custom Panel Building Shop (UL 508A, UL 698A)
- Process and System Controls Engineering
- Wireless Communications (Wireless Telemetry)
- Instrument Calibrations
- Windows Software Development
- Web Application Development
- App Development (Android, iPhone)

COMMUNICATIONS & IT

- Structured Cabling Systems
- Fiber Optic Systems
- Access Control
- Video Security
- Telephone Systems
- IT Network Service and Support
- Design and Engineering

ELECTRICAL

- Design-Build
- Industrial Installations
- Commercial Installations
- Preventive Maintenance Partnerships
- Building Information Modeling (BIM)
- Lightning Protection
- Lighting Retrofits/Upgrades
- Billboard Maintenance
- Electrical Engineering
- Generator Installation
- Energy Efficiency Upgrades

OUTDOOR UTILITIES

- Sports Field Lighting
- General Site and Parking Lot Lighting
- Medium Voltage Overhead Distribution
- Medium Voltage Underground Distribution
- Medium and High Voltage Substations
- Traffic Signal Construction and Maintenance
- Distribution System Maintenance
- Airport Runway Construction and Maintenance
- Transformer Oil Testing and Maintenance

RENEWABLE ENERGY

- Utility Scale PV Solar Systems
- Commercial Scale PV Solar Systems
- Utility Scale Wind Systems
- Commercial Scale Wind Systems
- Interconnection Substations
- Wind and Solar Plants Operations and Maintenance



WINDEMULLER SAFETY DATA

	2020	2019	2018	2017	2016
EMR Rating	.44	.87	.83	.82	.82
OSHA Recordable Rate	.97	1.18	.42	0	2.03
Man Hours Worked	452,921	507,036	471,439	424,273	485,716
Number of Employees	227	226	218	216	214

TRAINING

At Windemuller, we consider safety to be our number one priority. We require each new employee to undergo a regiment of safety training courses, from first aid, to fire safety, to working in specific, stressful construction environments, assigned on an individual basis depending on the worker's job function in the company. In addition, every worker must participate in ongoing safety education, with six courses required each year beyond the introductory materials. These requirements have helped Windemuller greatly in its goals of eliminating the causes of all workplace injuries, providing a safe work environment with no potential of injury, and abiding by all regulations set forth by federal, state, and local standards.

Windemuller has been praised for its ongoing commitment to safety and workplace awareness, receiving an average EMR safety rating of .864 over the past five years, and inspiring Berends, Hendricks, Stuit Insurance Agency to declare, "The high priority you have placed on workplace safety and the investment you have made in employee safety education have had a major influence in the low frequency and severity of workers compensation incidents."

With our efforts redoubled and our commitment to our employee's well-being as strong and pronounced as ever, we only hope to see our number of workplace accidents decrease in the years to come.

COMMON REQUIRED COURSES

- Aerial Lift Safety
- Asbestos Awareness
- Confined Space - Construction
- Construction Safety Orientation
- Fire Safety
- First Aid
- Hazard Communications
- Lock-out/Tag-out
- Personal Protective Equipment
- Slips, Trips & Falls
- Electrical Safety Specialties
 - Energized Electric Work Permit
 - High Voltage - Awareness
 - High Voltage - Self Work Practices

Our team has achieved certifications as Wind Energy Competent Rescuers - 2 Day 16 Hour, meeting the fall protections training requirements of OSHA, ANSI and CSA.

ADDITIONAL SPECIALIZED CERTIFICATIONS

- Back Injury Prevention
- Back Safety
- Compressed Gas Cylinders
- Decision Driving
- Excavations, Trenching & Shoring
- Fall Protection
- Forklift Safety
- Hand & Power Tool Safety
- Hoists & Slings
- Incident Investigation
- Intro to OSHA
- Ladder Safety
- Leadership Skills for Safety/Supervisory Safety
- CPR/AED
- Lead Awareness
- NCCCO Crane Certified Operators
- OSHA 30
- RF Frequency Awareness
- Scaffold Safety
- Tower Climber/Rescuer
- Materials Handling
- Muscle Strain & Sprains
- Rigging Safety
- Road Rage
- Workplace Violence



RENEWABLE ENERGY: CONSTRUCTION

Windemuller's utility scale wind farm experience began back in 2000, with the installation of two 1MW NEG Micon wind turbines in Mackinaw City, Michigan. This project, while small compared to today's projects, allowed us to pioneer new skills and become experts in wind energy electrical balance-of-plant design. Since then, we have been the electrical balance-of-plant-design and build contractor on projects such as the 60MW Stoney Corners Wind Farm and the 100MW Garden Wind Farm.

Our design-build partnerships facilitate the interconnection agreement with utility companies, coordinate with the distribution system operators, and provide design and installation of the substation, module selection, inverter selection, collection system, foundation conduits, foundation grounding, redundant fiber interconnection, SCADA system, and tower wiring. Our renewables experience includes working with Chint Power Systems, Gamesa, Vestas, NEG Micon, Northern Power, Repower, Astronergy and others

Windemuller's expert design and construction professionals are able to help take your renewable energy project from concept through construction and into operation.

CONCEPT

Our trusted ability to study, negotiate and determine the optimal availability of transmission infrastructure is key for site selection and layout.

CONSTRUCTION

We have the unique in-house capability to design and install the complete electrical, communication, control and collection systems. Utility Interconnection, Transmission Lines, Substations, Tower Wiring and Fiber Optic SCADA Systems.

OPERATION

Our reliable operation and maintenance technicians are trained and experienced to safely perform a full range of component repair and maintenance.





RENEWABLE ENERGY: PROJECTS

GARDEN SOLAR PROJECT

- Location: Garden, Michigan
- Contract Amount: \$1,400,000

This solar array was part of a power purchase agreement with Cloverland Electric. The project included a separate SEL 735 revenue grade meter in the control house for accounting purposes, utilized HRE string inverters on fixed racking, 480V/34.5kV 1500 KV transformer and 480V distribution equipment. The Windemuller team coordinated with MISO's updated FERC requirements to connect to the ATC grid. Adding active voltage regulation to this substation was an important part of making this project a success, providing Cloverland Electric with renewable energy.



GRAWN SOLAR PROJECT

- Location: Grawn, Michigan
- Contract Amount: \$1,100,000

This solar array was part of a power purchase agreement with Cherryland Electric. The project utilized CPS string inverters and a 480V/34.5kV transformer with distribution equipment. Windemuller's automation team added network electronics, an HMI and a SCADA system with real-time observation of the inverter production online. The power was generated on 35-degree fixed racks from 3,500 345W modules to provide Cherryland Electric with renewable energy.





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RENEWABLE ENERGY: PROJECTS

M-72 SOLAR PROJECT

- Location: Traverse City, Michigan
- Contract Amount: \$1,600,000

This solar array was the first of its size in Traverse City. The project utilized CPS inverters with a scalable design, a prefabricated 34kV transformer skid with the distribution equipment and electronics already built and mounted. Windemuller's automation team added network electronics, an HMI, and a SCADA system with real-time observation of the inverter production online. The power was generated with 3,600 355W modules on 35degree fixed racks to provide Traverse City Light & Power with renewable energy.



STATE OF MICHIGAN DEPARTMENT OF EDUCATION

- Location: Multi-site, Michigan
- Contract Amount: \$525,000
{Project Size: 18.7kW}

The state of Michigan wanted to put wind and solar renewable energy on multiple sites throughout the state. This project provided an opportunity for today's STEM students, and tomorrow's leaders, to experience the benefits of renewable energy firsthand.





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RENEWABLE ENERGY: PROJECTS

STONEY CORNERS WIND FARM

- Location: McBain, Michigan
- Contract Amount: \$9,364,000

Windemuller's Stoney Corners Wind Farm project near McBain, Michigan, leveraged many strengths of our team. The design-build construction included a 60MW substation with two 34.5kV to 69kV transformers; more than 17 miles of collection circuits requiring multiple road bores and high pressure gas line crossings; fiber optic cables and network electronics to provide redundant communications, and SEL programming and metering integration with the grid operator and utility (DTE).



BIG TURTLE WIND PROJECT

- Location: Harbor Beach, Michigan
- Contract Amount: \$10,910,000

The Big Turtle Wind Farm project near Sand Beach Township, Michigan, utilized many assets of the Windemuller design-build team. The construction included a new 50MW substation connected to a 120kV transmission line. The SCADA work at the control house included installation of SEL relays and control house wiring, integration of the revenue grade metering to communicate with DTE and the developer, and automation of the control relays to meet the voltage and power quality requirements of the transmission company (ITC) and the system operator (MISO). There were 24 wind turbine generators constructed, wired, and commissioned, along with more than 20 miles of collection circuit installed. Collection circuits required boring roads and streams, coordinating permits, coordinating with landowners, and restoring fields to pre-construction conditions.





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RENEWABLE ENERGY: PROJECTS

GARDEN WIND PROJECT

- Location: Garden, Michigan
- Contract Amount: \$8,200,000 million

Windemuller's Garden Wind Power project, located on Garden Peninsula between Manistique and Escanaba in Michigan's Upper Peninsula, consists of a 10 miles, 138kV transmission line, 70MW substation, and 14 2-Megawatt Gamesa G97 Wind turbines. Our team designed and installed the transmission line, substation, collection system and tower wiring, and SCADA System.

Power from the project is currently being purchased by DTE Energy and Consumers Energy, and the system is being interconnected to ATC.



MACKINAW WIND PROJECT

- Location: Mackinaw City, Michigan
- Contract Amount: \$150,000

Located on Mackinaw City's waste water plant, this project was comprised of two wind turbine generators, each standing at 230 feet high with three 85-foot blades. Windemuller's team designed and installed the primary distribution system for the 5MW wind farm, but only 2MW of power were installed. These were the first utility scale wind turbines ever installed in the state of Michigan.





RENEWABLE ENERGY: WIND FARM MAINTENANCE

Windemuller's renewable energy maintenance experience includes electrical balance-of-plant and wind turbine maintenance. Electrical balance-of-plant maintenance covers substation repairs, collection system cable testing, transformer oil testing, infrared surveys, and arc-flash studies and labeling.

Our wind turbine maintenance experience includes

yaw motor replacement, main-gear replacement (including rigging), converter component replacement, tower lighting replacement, FAA light troubleshooting and replacement, and primary switch replacement. Our crews have specialized tower climbing and rescue training, and we can attain specific manufacturer component certifications if required.

Our inspection, maintenance and reporting services for your turbines can include:

- General Cleanliness
- Safety Tower Lighting (FAA)
- Infrared Scans
- Oil Testing
- Voltage Testing
- Elevator Operation
- Elevator Cable
- Power/Communications Cable Twist
- Yaw Gear
- Yaw Brakes
- Transformers
- Control Cabinet
- Converter System
- Generator
- Gear Box
- Coolant System
- Wiring, Connections
- Lubrication
- Nacelle Housing
- Weather Stations
- Hoist Operations
- Pitch System Components
- Lightning Damage
- Fire Extinguishers

Additional services include:

- Megger Testing
- Hi-Pot Testing
- Lightning System Testing
- Root Cause Investigation
- Feasibility Studies
- Siting Studies
- Custom Reporting

Other Renewable Energy Services:

- Utility Scale PV Solar Systems
- Commercial Scale PV Solar Systems
- Utility Scale Wind Systems
- Commercial Scale Wind Systems
- Interconnection Substations
- Wind and Solar Plants Operations and Maintenance

