

## Advanced Insulation System and Modern Test Station

90% of wind generator sets are connected to an electric grid through converters. Electrical stresses from converters typically result in high voltage spikes and high frequency, which could then result in failures or accelerated aging problems on cable insulation, slip ring insulation and brushes, bearing insulation, and stator or rotor winding insulation.

TECO's advanced and high quality insulation system will solve the typical problems encountered by most wind generator customers by protecting the generator components, preventing failure due to corresponding high voltage pulses, and reducing down time. TECO has been researching wind generator insulation systems since 2000. With extensive experience in generator designs, advanced engineering software and test equipment, TECO developed a high quality, Class H insulation system for wind generator applications. It ensures that no partial discharge phenomenon will occur at the maximum operating voltage. The insulation life is designed for 20 years, as tested per IEC/IEEE standards.

In addition to the development of an advanced wind generator insulation system, TECO has also established a modern test lab to inspect, analyze, and test insulation systems to verify suitability for converter applications with PWM stress, further ensuring that all TECO wind generator products are designed and manufactured with exceptional quality.

# WIND TURBINE GENERATORS

- High Reliability & Efficiency
- Low Maintenance, Optimum Design
- Patented Robust Bearing Insulation Design for Challenging Wind Environments
- Partial Discharge-Free Winding Insulation System
- Global Design, Manufacturing, & Service Capability

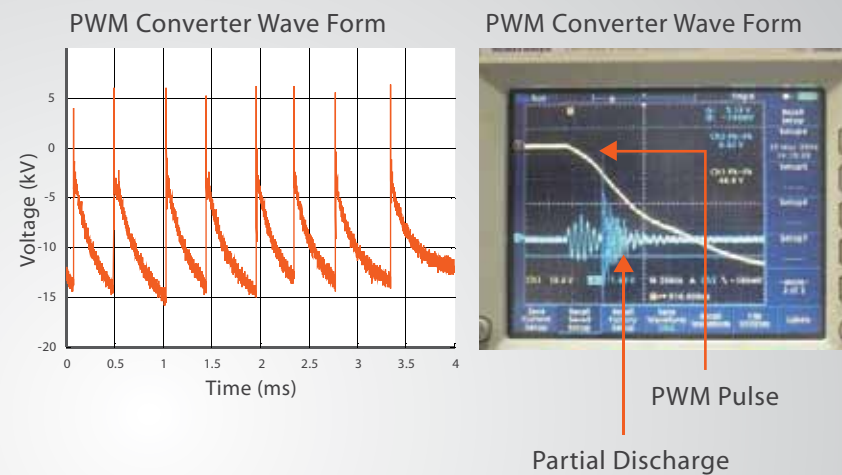
### Broad Product Offering

DFIG | PMSG (low to high speed) | Synchronous | High Temperature Superconducting Generator

TECO Aging Test of 8 MW Wind Generator Stator



- Multiple Stress Test Bed test level per (IEC60034-18-42)
- Mechanical
  - Thermal
  - PWM Voltage Up to 27kV



Partial Discharge Test under PWM Voltage Conditions (IEC 61934-2010)



## Advanced Technology, Exceptional Quality, Professional Service

Global demands on renewable energy are increasing. As a leader in manufacturing world class generators and motors, TECO utilizes universal vision, professional technology, and localized service to provide safe, reliable and high efficiency products for customers to have the best solution available in renewable energy.

With Westinghouse heritage and TECO's modern manufacturing expertise, the company proudly offers advanced R&D design capabilities, reliable manufacturing processes, rich global resources, and a strong management team. TECO currently has design, manufacturing and R&D facilities in Taiwan, China, and the USA. Continuous efforts are made to develop new generators and motors for a wide variety of applications. Additionally, a global sales and service network provides worldwide coverage to ensure local support networks for all customers. TECO is also leading the development of cutting edge technologies in permanent magnet (PM), high temperature superconductor, and high voltage/ high efficiency generator or motor designs, as well as advanced insulation systems for inverter applications.

### Wound Rotor Technology



### TECO is a Global Pioneer in Wound Rotor Machine Designs and Manufacturing

- Over 40 years of experience
- Product lines up to 3600 RPM, 13.8kV, 15,000 hp
- Rugged design to ensure long term reliability
- Experienced global R&D design centers

## Global Supply, Global Service

TECO's manufacturing facilities for wind generators are located in the USA (Texas), China (Jiangxi Nanchang & Jiangsu Wuxi), and Taiwan (Chungli). Our delivery and service networks cover 45 countries and 5 continents. Because of our extensive experience and excellent design capabilities, we can provide the best quality products at a highly competitive price with flexible and professional service to wind generator customers.

### ● OEM Products for Your Global Demands

- Strict protection of customer's confidential design information
- Minimal lead times from order in-take to delivery
- Extensive mass production



### ● Customer Designed Products per Your Specifications

- Minimal lead times from order in-take to delivery
- Extensive mass production



### ● Jointly Designed Products

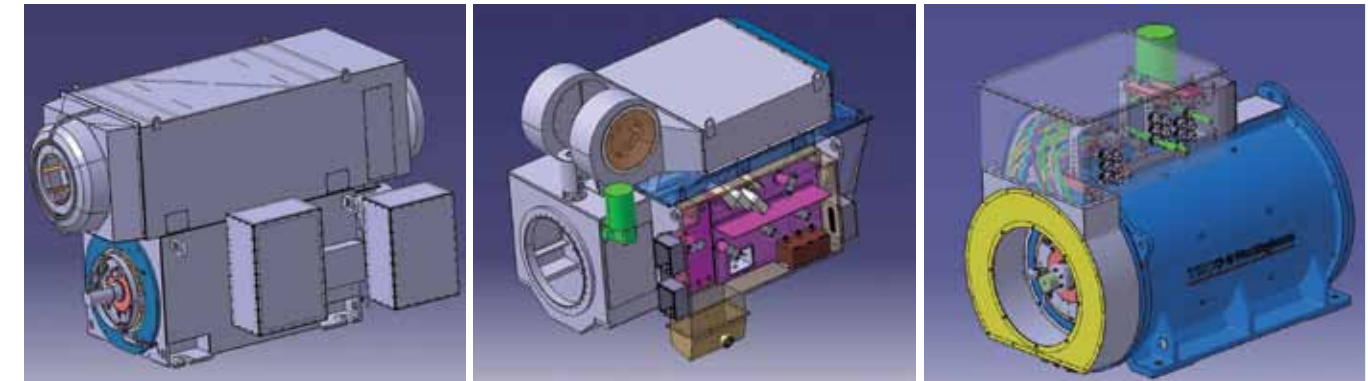
- TECO welcomes the opportunity to work with customers on specific design requirements and is committed to developing products with optimal performance and benefits through a mutual effort.

### ● Modify, Exchange, and Upgrade Existing Wind Generators

## Full Line of Wind Generators & Components

TECO can supply various types of wind generators such as Double-Fed Induction (DFIG), Synchronous, and Permanent Magnet (PM) Synchronous machines, as well as key components such as PM rotors and stators. The maximum output for TECO generators is currently 5 MW, meeting the requirements for most wind generator customers.

TECO has several wind generator manufacturing facilities in both North American & Asia, allowing them to provide timely products and services.



### Double-Fed Induction

- 500 kW ~ 3 MW available (Higher power ratings available upon request)
- Efficiency  $\geq 96\%$
- Power factor from  $-0.9 \sim +0.9$
- Variable speed from  $68\% \sim 134\%$  of synchronous speed
- Optimum reactive power control

### Synchronous

- Rating 1 ~ 5 MW
- Efficiency  $97\% \sim 98\%$
- Variable Speed 15 ~ 1800 RPM
- Optimum reactive power control

### Permanent Magnet

- Rating 0.1 ~ 5 MW
- Efficiency  $96\% \sim 98\%$
- Variable Speed: 15 ~ 1800 RPM
- Direct or gear drive
- Voltage suited to application
- Capability to withstand severe demagnetization faults

### Enclosure Types

- Totally Enclosed Air-to-Air Cooled (TEAAC): IC616, IP54
- Open Drip Proof (ODP): IC26, IP23
- Totally Enclosed Water Cooled (TEWC): IC4A1W7, IP54

## Product Images for TECO Wind Generators

▼ 0.85 MW Double Fed Induction



▼ 2.0 MW Permanent Magnet



▲ 1.5 MW Double Fed Induction



▲ 2.0 MW Synchronous Generator