

UL Now Investigates Wind Turbine Generating Systems



Wind turbine generating systems are being installed in an ever-increasing number of locations. To address safety concerns with these systems, UL has developed requirements to evaluate the safety and performance of these systems, and is offering certification services for this equipment.

What makes a wind turbine generating system?

Wind turbine generating systems (WTGS) produce electric power from a wind driven generator. A wind turbine consists of blades, hub, generator, drive train, support structure, controls, power collection, power distribution and protection systems. Small WTGSs are defined as wind turbines with a rotor swept area of 200 m² (16 meters rotor

diameter) or less, and an output terminal voltage of 600 Volts or less. Large WTGSs are defined as turbines with a rotor swept area larger than 200 m² (16m rotor diameter). Large wind turbine assemblies, consisting of various electrical hardware components and subassemblies, constructed and interconnected in accordance with electrical safety requirements, are used to create a complete wind turbine.

The UL Subject 6140-1, Outline of Investigation for Wind Turbine Generating Systems was developed to evaluate large and small WTGSs, large wind turbine assemblies, and safety related control systems. WTGSs investigated in accordance with Subject 6140-1 are evaluated for risk of fire and shock, safety related control system electrical performance, and utility grid-interconnect performance for Utility Interactive models.

continued »



The electrical equipment is intended for installation in accordance with the requirements in Article 705 of the National Electrical Code® (NEC®). Mounting means, support structures, wind turbine blades, and/or rotors are only evaluated to the extent that they include the necessary electrical components to comply with the applicable electrical safety standards. Local wind, snow and seismic loading, and local soil conditions are unique for each jobsite location and should be evaluated by the local authorities having jurisdiction.

Safety related control systems

Safety related control systems (SRCS) consist of electrical hardware and software which operate to control and protect the WTGS. These systems are for use with specific WTGS as defined by each product's UL Classification.

The SRCSs are evaluated to perform specific wind turbine control and protection functions to maintain the overall system within the manufacturer's specified operational limits. These control and protection functions are evaluated with respect to risk of electric shock and fire, and electrical response time. The electrical subassemblies that address power transfer control and protection functions evaluated by UL are intended to be coordinated with a mechanical and structural evaluation of the WTGS in accordance with other applicable standards.

Inverters and converters

Inverters are devices that change DC power to AC power. Converters are devices that accept AC or DC input power and convert it to another form of AC or DC power for direct utilization by a load or accumulation in an energy storage system (batteries, capacitors, etc.).

These devices are classed as utility interactive, stand-alone or multimode. utility interactive devices operate in parallel with the utility grid. Stand-alone devices are intended to operate independent of the utility grid. Multimode devices can operate as stand-alone (utility independent) and/or utility interactive devices. Each product is marked to identify its class.

Electric utility grid interconnection performance is evaluated to limits defined by the manufacturer for synchronization, overvoltage, undervoltage, overfrequency, underfrequency, clearing times, reconnect time, power factor, DC injection, harmonic distortion, unintentional islanding, power range and low voltage ride-through (if provided).

Inverters and converters may contain energy storage devices and associated charge controllers. Some devices must be installed and operated with an external transformer. Such devices are provided with markings and instructions to indicate the type of transformer required. Some devices may require external input and / or

output overcurrent protection, which will be specified in product markings and installation instructions.

These products may require external output overcurrent protection, which will be specified in product markings and installation instructions.

The UL Subject 6141 Outline of Investigation for Wind Turbine Converters and Interconnection Systems Equipment was developed to investigate inverters and converters. It requires that all converters be evaluated for both normal and abnormal conditions associated with the application (less electric utility "grid" interconnection protection). For electric utility connected converters this includes the evaluation of the unit's ability to:

- 1) parallel two sources of power
- 2) operate during normal utility operating conditions
- 3) provide a minimum level of output power quality including DC injection and
- 4) operate safely during abnormal utility grid conditions

UL Certification

UL certifications for wind turbines and related equipment will be covered under the following UL product categories:

- ZGEN Small Wind Turbine Generating Systems
- ZGEA Large Wind Turbine Generating Systems
- ZGBP Large Wind Turbine Generating Assemblies, Construction Only
- ZGFA Wind Turbine Inverters and Converters
- ZGCP Wind Turbine Safety-related Control System Equipment

Products certified under these product categories will include Classification Marks as described in the guide information for the product category.

