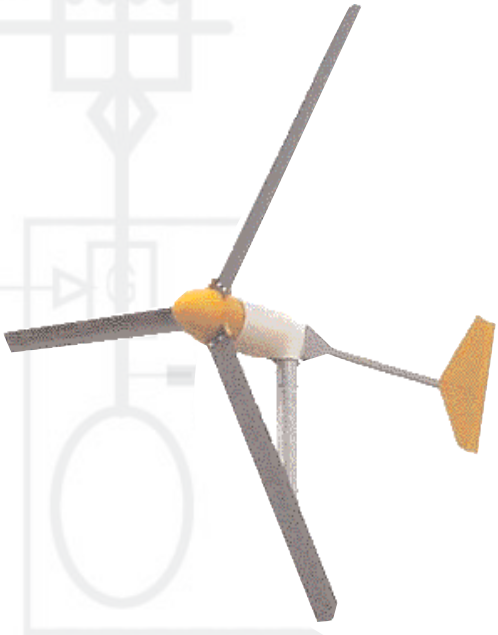
PUCO Staff's Guide for Interconnection Customers to IEEE 1547 Standards and Related Terminology: Simplified Definitions for Common Use

Offered as a public service
by the staff of the Public Utilities Commission of Ohio



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Background

On July 28, 2003, the Institute of Electrical and Electronics Engineers, Inc. (IEEE) published the 1547 Standard for Interconnection of Distributed Resources with Electric Power Systems (Std 1547). This initial Std 1547 was developed through discussions and negotiations in a series of meetings open to more than 340 participants under the sponsorship of the Standards Coordinating Committee 21 on Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage. The effort took over two years.

The initial Std 1547 is the first in a series of related IEEE standards that focus on Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems, (Std 1547.1) published in 2005; a proposed Draft Application Guide for IEEE Std 1547 (P1547.2) and a proposed Draft Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected with Electric Power Systems (P1547.4).

Purpose of IEEE 1547

The purpose of the Std 1547 is to provide a model to be used on a voluntary basis[1] by Congress, by regional entities such as Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs), in state and federal regulatory activities, as well as by the more than 3,000 electric utilities developing arrangements for interconnecting customers' distributed generators and related equipment. The requirements of Std 1547 are applicable to all distributed resources with a single or combined capacity of 10 megawatts or less at the single point where they are interconnected to a utility's distribution system.

Purpose of this *Interconnection Customer's Guide to 1547: Simplified Definitions for Common Use*

The purpose of this Interconnection Customer's Guide to 1547 from the Staff of the Public Utilities Commission of Ohio (PUCO) is to provide plain language descriptions and explanations of the IEEE Std 1547 as a public service for the potential interconnection customer.

Disclaimer

The material included here is in no way intended to be a comprehensive discussion of all the technical terms customers may expect in their discussions with the local electric company concerning interconnection of distributed resources. This material also is not intended to explain the terminology and technical requirements for any customer wishing to interconnect with high voltage transmission facilities for the purpose of entering into transactions in the wholesale bulk power market operated under the jurisdiction of the Federal Energy Regulatory Commission (FERC). The Public Utilities Commission of Ohio (PUCO) claims no endorsement of the IEEE definitions nor any other industry authority, nor does the PUCO recognize any use of these definitions to have force of law in any matter before the PUCO.

[1] In the case of the state of Ohio, section 4928.67 (C)(1) Revised Code, Standard contract or tariff for net energy metering, requires that "[a] net metering system used by a customer-generator shall meet all applicable safety and performance standards established by the national electrical code, *the institute of electrical and electronics engineers*, and underwriters laboratories". [emphasis added]

Definitions

Agreement – A contract or arrangement, either written or verbal, sometimes enforceable by law.

Alternator – A mechanical device that generates alternating current electricity.

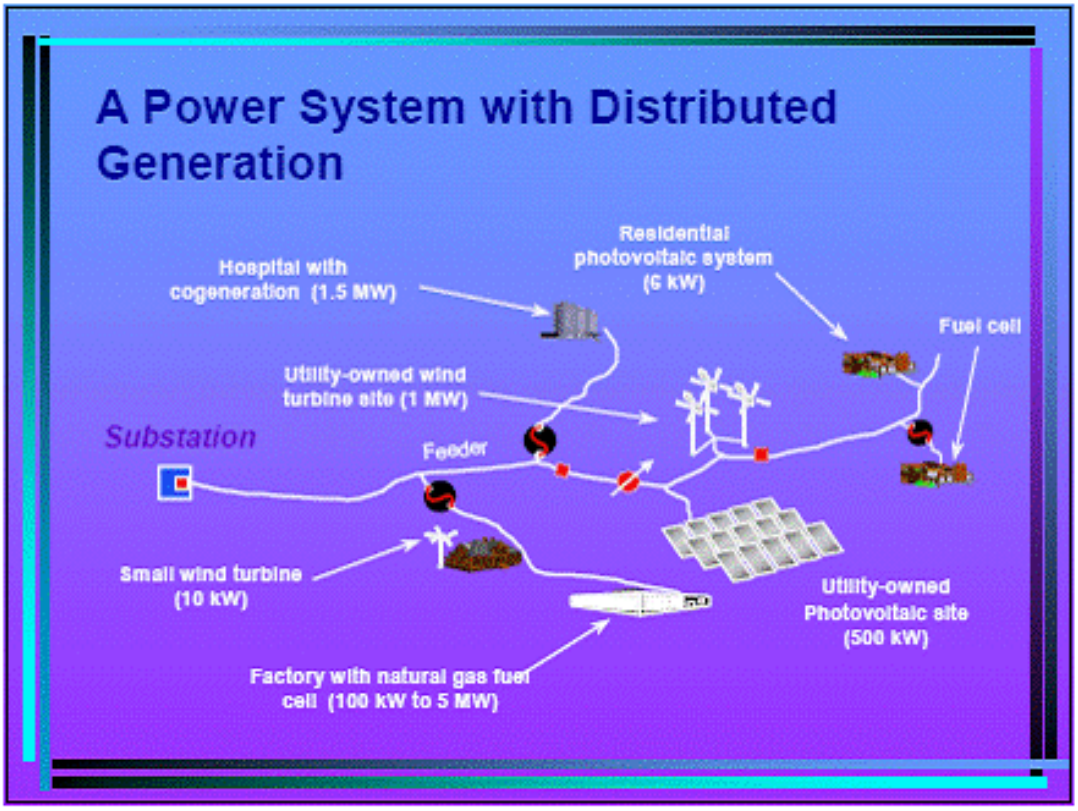
Alternating current (AC) – An electrical current in which the direction of the electron flow reverses periodically, usually many times per second. Most U.S. household electrical systems use AC current rated at 120 volts and 60 cycles per second.

Ampere (AMP) – The measure of how much electricity is moving through a conductor. One volt across one ohm of resistance causes a current of one ampere passing a given point in a circuit.

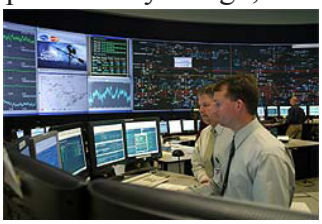
Array – A collection of electrically connected photovoltaic (PV) modules.

PV Array on the Ohio Governor's Residence Carriage House

Area electric power system (Area EPS) – An electrical system made up of generators that produce power and related services and a network of transmission and distribution facilities to deliver that power. The Area EPS may serve Local EPSs.



Area electric power system operator (Area EPS Operator) – The entity whose responsibility it is to monitor and control an area electric system in real time. The area EPS Operator may design, construct, and maintain the network that provides electricity from a system made up of generators that produce power and related services and a network of transmission, and distribution facilities that deliver that power to residential, commercial, and industrial customers for their use.


Control Room at Area EPS

Battery – An electrical storage devise comprised of two or more electrochemical cells interconnected in an appropriate series parallel arrangement to provide the required operating voltage and capacity levels. Under common usage, the term battery also applies to a single cell if it constitutes the entire electrochemical storage system.

Biomass – Any organic matter available on a renewable basis including agricultural crops, waste residues, wood, wood wastes and residues, animal wastes, and municipal wastes and aquatic plants.

Biofuels (biomass fuels) – Biomass converted directly to energy or converted to liquid or gaseous fuels, such as methane and hydrogen.

British Thermal Unit (BTU) – The amount of heat required to raise the temperature of one pound (one pint) of water one degree Fahrenheit. One (1) watt-hour equals 3.314 BTUs.

Bulk power – Massive or bulk quantities of electric current transferred on the high voltage transmission lines of an electric power system to destinations that could be hundreds of miles away. In the U.S., bulk power transactions for the purpose of wholesale interstate commerce are under the legal jurisdiction of the Federal Energy Regulatory Commission (FERC).

Bulk power system – The electrical generation resources, transmission lines, and interconnections with neighboring systems, and associated equipment, generally operated at voltages of 100 kilovolts (kv) or above.


Transmission lines part of the bulk power systems

Bus – An electrical connection component that can accept multiple cables or wires. Also buss, bus bar, or busbar.


Bus

Capacitor – A device that stores electrical charges and can be used to maintain voltage levels in power lines and improve electrical efficiency.

Capacity – The capability to generate electrical power, usually measured in megawatts (MW) or kilowatts(kW).

Capacitance – An electrical effect in alternating current circuits that results in amperage peaking before voltage.

Cease to energize – Discontinue energy flow capability.

Certification – The act of testifying to the factuality or truth of something; to guarantee as meeting a standard.

Charge – A characteristic of matter responsible for all electric phenomena, particularly the force of the electromagnetic interaction occurring between two forms of matter that are considered either positive or negative; a measurement of this characteristic.

Circuit – A closed path followed or capable of being followed by an electric current. When a circuit is open, the flow of electric current is broken.

Cogeneration – Production of electricity and usable heat or steam from a single facility.

Commissioning – To grant the authority to carry out a particular task or active service.

Commissioning tests – Tests needed to confirm that the interconnection and equipment of a Distributed Resource functions for the purposes of operating in conjunction with an EPS in accordance with IEEE standards, specifically IEEE Std 1547.1, the Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems.

Conductor – A material with relatively low resistance through which electricity will readily flow. Wires, cables, busbars. The most common conductors are copper or aluminum.

Converter – An electronic device for direct current (DC) power that steps up voltage and steps down to another DC voltage.

Current – Flow rate of electrons (see also Amperes); the amount of electric charge flowing in a conductor between two points having a difference in potential or voltage.

Customer – A person who buys goods or services, especially on a regular basis.

Customer's premises – Discrete contiguous real property under the customer's control through ownership or lease.

Cycle – An alternating current (AC) sine wave's movement for one complete series of changes of value from zero to maximum positive, through zero, to a maximum negative, and back to zero.

Demand – The amount of electricity drawn from an electric power system at a given instant in time, generally measured in kilowatts or megawatts.

Demand charge – A charge by a utility company for electricity based on the maximum amount of a system's electricity a customer uses.

Deregulation – Major reduction of government oversight in a segment of private industry.

Diesel generator – An electric generator that is driven by an internal combustion engine designed to use the heat of highly compressed air to ignite a spray of fuel introduced after the start of a compression stroke. Named after its inventor, Rudolf Diesel (1858 – 1913).

Diode – A semi-conductor device that allows electrical current to flow in only one direction.


Diesel Generator

Direct current (DC) – A one way flow of electrons. Typical sources of direct current are solar cells, rectifiers, and direct current generators. To be used for typical 120 volt or 220 volt household appliances or transfer through conductors dedicated to alternating current (AC), direct current must be converted to alternating current.

Direct current injection – May be limited by the full rated output current at the point of Distributed Resource interconnection.

Disconnect – Especially in electricity, to shut off the current in a device by removing its connection with the power supply.

Disconnect switch – Switch gear used to connect or disconnect components of a system.

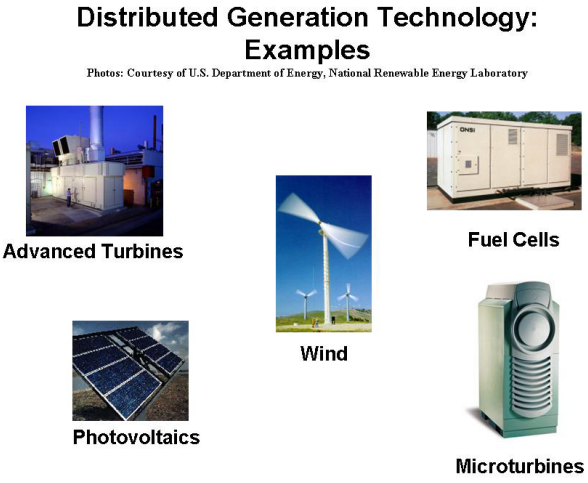
Distribution system – The poles, wires, and transformers used to deliver electric energy from a bulk power supplier to the consumer.

Disturbance – An unplanned event that produces an abnormal system condition on the EPS, as in the sudden failure of generation or interruption of load.

Design test – A test of a device to determine if the design of that device meets certain requirements or specifications and contains no defects that would adversely affect its correct functioning.

Distributed generation (DG) – A general term for all or part of the customer's distributed electrical generator(s) or inverter(s) together with all protective, safety, and associated equipment necessary to produce electric power at the customer's facility. The generator itself can be any type of electrical generator or static inverter. A distributed generator is one kind of distributive resource.

Distributed resources (DR) – A device converting mechanical, chemical, or solar energy into electrical energy that is not directly interconnected to the transmission system used for bulk power. The distributive resource can be any variety of on-site, non-central station generation application generator or some sort of electric storage device.



Distortion – An undesired change in the waveform of a signal.

Downtime – Time when a distributive resource provides power to the load.

Electricity – Electric current or power that results from the movement of electrons in a conductor from a negatively charged point to a positively charged point.

Electric energy – The flow of charged particles (electrons).

Electric current – A flow of electrons through a wire or other conductor.

Electric power system (EPS) – Electric facilities that deliver power to a load. The term EPS can be applied to both the area and local electric power system.

Electric power system, area (Area EPS) – An electric power system (ESP) that serves a Local EPS. The utility in the area that provides electricity to residential, commercial, and industrial customers through their generation, transmission, and distribution network and typically have access to public rights-of-way and priority crossing of property boundaries.

Electric power system, local (Local EPS) – The Local EPS that is concentrated within a local area or a group of local premises and delivers energy to customer load. The local EPS can include distributed generators and electric storage devices.

Electromotive force – The energy per unit of charge that is converted reversibly from chemical, mechanical, or other forms of energy into an electrical energy device such as a battery.

Electron – A negatively charged particle.

Energy storage – A device capable of absorbing voltage for future use, for example, a battery.

Engine – A machine that converts energy into mechanical force or motion. Sources of energy include, for example, heat, chemical reaction, or potential energy of elevated water.

Excite – To energize electrically, to activate the flow of electrons.

Facilities study – An engineering study conducted to determine the modifications to the existing utility system that will be required to accommodate the requested interconnection.

Fault – An event occurring on an EPS such as a short circuit, a broken wire, or an intermittent connection.

FERC –The Federal Energy Regulatory Commission, an agency of the federal government responsible for regulation of electric and gas utility installations and wholesale services used in interstate commerce.

Flicker – Fluctuating or unstable voltage on the EPS that adversely affects or is objectionable to neighboring customers on the EPS, such that light levels are irritating to people or the occurrence of flicker causes equipment to operate improperly.

Fossil fuel – Materials that were formed in the ground millions of years ago from plant and animal remains such as coal, oil, or natural gas, now used to produce heat or power; also called conventional fuels.

Frequency – The number of repetitions of a complete waveform, as of an electric current, such as that produced by the oscillation of electricity in a conductor. Under Std 1547, a Distributive Resource must, under abnormal conditions on the EPS, cease to operate within the clearing times set by IEEE for the capacity (size) of the Distributed Resource installation.

Fuel cell – A device that changes the chemical energy of fuels directly into electricity.

Functionality – Capable of performing or operating as in an assigned interdependent activity.

Functionality test – Any test that observes the process or operation of certain equipment, software, or procedures.

Generator – A device that converts mechanical energy into electrical energy.

Grid – An interconnected system of electric cables and power stations that distributes electricity over a large area.

Ground – The connection of electrical components to the earth and/or each other for the purposes of dissipating static charge or protecting against a short circuit or lightning.

Ground fault – Unwarranted path to the ground.

Grounding integration with Area EPS – Under Std 1547, verifying a system design to determine that the Distributed Resource grounding capability avoids causing overvoltages greater than the rating of the Distributed Resource, as well as avoiding disruption of the ground fault protection of the EPS.

Harmonics – A set of waves whose individual frequency is a whole-number multiple of that of another wave.

Hertz (Hz) – A unit of frequency or vibration equal to one cycle per second (named after Heinrich R. Hertz, 1857 – 1894). The alternating current frequency used in North America is 60 Hz, while in Europe and some other parts of the world, the frequency used is 50 Hz.

IEEE – An abbreviation for the Institute of Electrical and Electronics Engineers, Inc., a non-profit technical professional organization with members in 150 countries, responsible for technical publishing, conferences, and consensus-based standards activities. (www.ieee.org)

Impedance – The total opposition offered by an electric circuit to the flow of an alternating current of a single frequency. A combination of resistance and reactance, measured in ohms.

Inadvertent energization of the EPS – Under Std 1547, when the EPS is de-energized, the Distributive Resource must not energize the EPS.

Induction – The generation of electromotive force in a closed circuit by varying magnetic flux through the circuit.

Induction machine – A device designed primarily to introduce inductance into an electric circuit.

Induction interconnection – Under Std1547, self-exited induction Distributed Resource generators are required to be tested to determine the highest level of current needed for start-up by the Distributed Resource. The test results will be used relative to impedance on the EPS to determine the voltage drop at start and verify that the Distributed Resource does not violate synchronous and flicker standards.

Interconnection – The physical connection of a generating facility in accordance with the requirements of this standard so that operation in parallel with the utility's local distribution system can occur.

Interconnection customer – Any entity interconnected to the EPS for the purpose of receiving or exporting electric power to the EPS.

Interconnection equipment – The electrical wires, switches, and related equipment that are required in addition to the utility facilities that provide electric distribution service to a customer to allow interconnection of a customer's distributive resource. Interconnection equipment may be located on either side of the point of common coupling, as appropriate to the purpose and design of the customer's distributive resource. Interconnection equipment may be internal to a generating facility or provided separately.

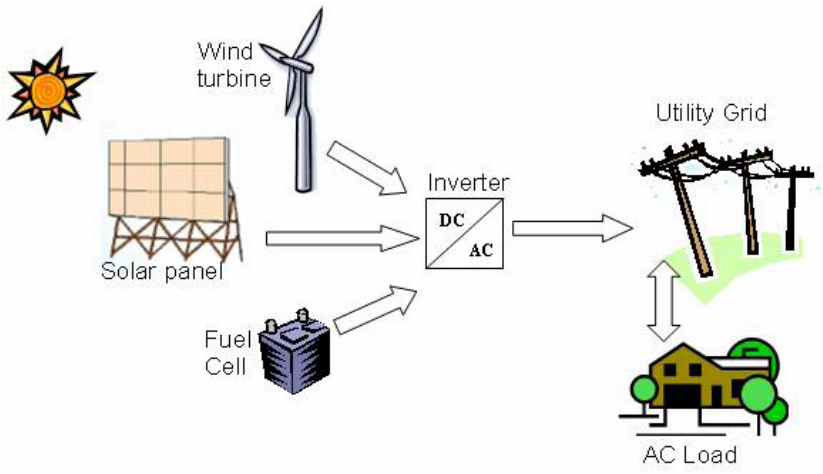
Interconnection system – The interconnection equipment and their functions that collectively interconnect a distributed resource to a utility electric power system (EPS).

Interconnection test specifications and requirements – Under Std 1547, test requirements that determine the Interconnection system based on the rating of a Distributed Resource or set of Distributive Resources on an EPS to meet functional requirements (not related to any specific equipment) regardless of the location of the Distributed resource(s) on the EPS.

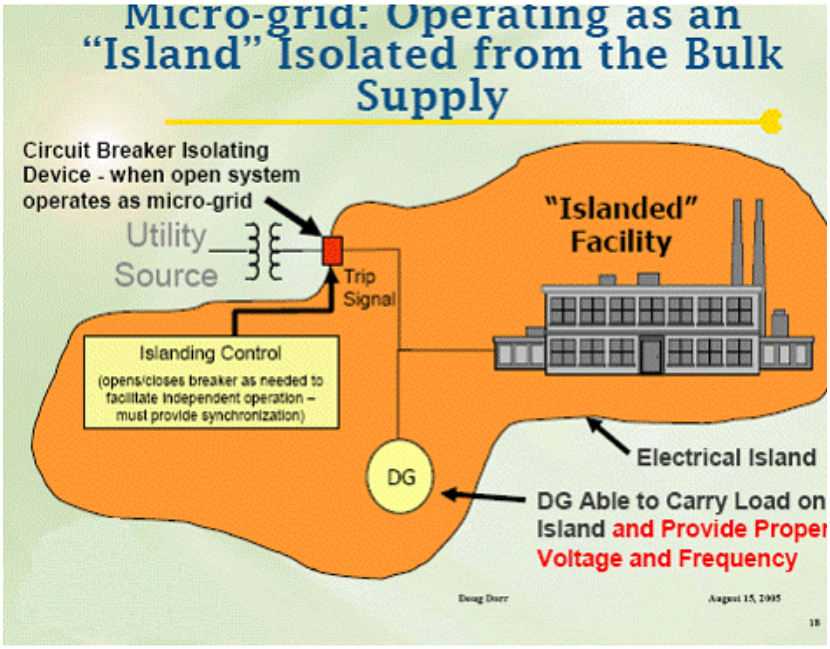
Interconnection installation evaluation – Under Std 1547, this evaluation is comprised of a series of system design verifications to ensure that the Distributed Resource grounding is coordinated with the EPS; that isolation devices meet Std 1547 requirements; that monitoring provisions are in place; that fault requirements are met; and the interconnection system of the Distributed Resource is coordinated with EPS reclosing practices.

Inverter – A device or system that can change direct current power (DC) to alternating current power (AC).

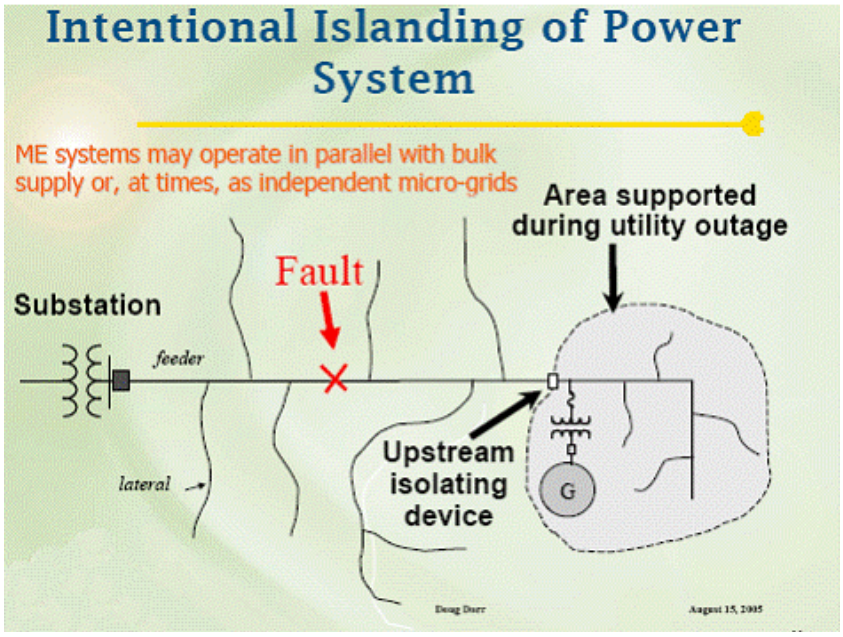
Isolation device – Under Std 1547, a required easily accessible, locking, visible breaker device capable of being located between the Distributed Resource and the EPS.



Island – Circumstances in which part of an EPS is operating while being electrically isolated from the rest of the EPS.



Island, intentional – A planned condition on an EPS in which one or more generating facilities deliver power to customers using part of the EPS that is intentionally electrically isolated from the remainder of the EPS.



Island, unintentional – An unplanned condition on an EPS in which one or more generating facilities deliver power to customers using part of the EPS that has inadvertently become electrically isolated from the remainder of the EPS.

Kilovolt (kv) – 1,000 volts. The amount of electric force carried through a high voltage transmission is measured in kilovolts.

Kilowatt (kW) – The basic unit of electric demand, equal to 1,000 watts; for example, the average household demand is 10 – 20 kilowatts.

Kilowatthour (kWh) – A unit of energy of work equal to 1,000 watthours. The basic measure of electric energy generated for use. For example, a 100-watt light bulb burning for 10 hours uses one kilowatthour of energy.

Line – A carrier of electricity on an electric power system.

Load – The amount of electric power drawn at a specific time from an electric power system, or the total power drawn from the system.

Load factor – The ratio of average demand to peak demand; a measure of efficiency that indicates whether a system's electric use over a period of time is reasonably stable, or if it has extreme peaks and valleys.

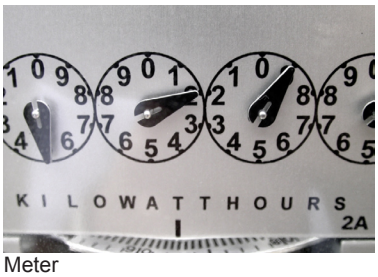
Loss of synchronization – Equipment with out-of-step protective functions intended to isolate a synchronous Distributed Resource generator subject to a specific stiffness ratio from the EPS without any intentional delay.

Magnetic flux – The total number of magnetic lines of force passing through a bounded area in a magnetic field.

Megawatt (MW) – A unit of energy equal to 1,000 kilowatts or 1 million watts.

Megawatthour (MWH) – A unit of energy of work equal to 1,000 kilowattshours or 1 million watthours.

Meter – A device used to measure, display, and record the amount of power flow in kW and/or kWh, and/or energy in kWh, at a point on the electric power system.



Meter

Microturbine – A very small combustion turbine, individually of the size of a refrigerator, that are often packaged in multiunit systems. In most configurations, the microturbine is a single-shaft machine with the compressor and turbine mounted on the same shaft as the electric generator. With a single rotating shaft, gearboxes and associated parts are eliminated, helping to improve manufacturing costs and operational reliability. The rather high rotational speeds vary in the range from 50,000 to 120,000 revolutions per minute (rpm), depending on the output capacity of the microturbine. This high-frequency output is first rectified and then converted to 50 or 60 Hz. Microturbines are capable of burning a number of fuels at high- and low-pressure levels, including natural gas, waste (sour) gas, landfill gas, or propane.


Microturbine

Minimum power test – Under Std1547, a test for a power function used to meet requirements to detect an island and cease to energize the EPS within a specific time limit in the event of the formation of an island.

Monitoring provisions – Any Distributive Resource or set of aggregated Distributed Resources of 250 kva or more at a Point of Distributed Resource Connection shall provide the EPS Operator with the status of a means to monitor the status of the Interconnection, including the output by the Distributed Resource of real and reactive power and voltage at the Point of Distributed Resource Connection.

NEC – An abbreviation for the National Electric Code which contains guidelines for all types of electrical installations.

Network – A group or system of electric components and electric circuitry designed to function in a specific manner.

Network bus – An electrical connection component on a wires network; see also the definition of bus.

Network protectors – Breakers and associated relays and control equipment used to connect transformers to secondary networks. Under Std 1547, unless tested and rated according to applicable standards, network protectors are not permitted for use with Distributed Resources to separate, isolate, switch, or break the circuit of a primary network feeder connecting the Distributed Resource to the EPS

Non-islanding – An action or device that is capable of ending or reversing electrical separation from the rest of the EPS.

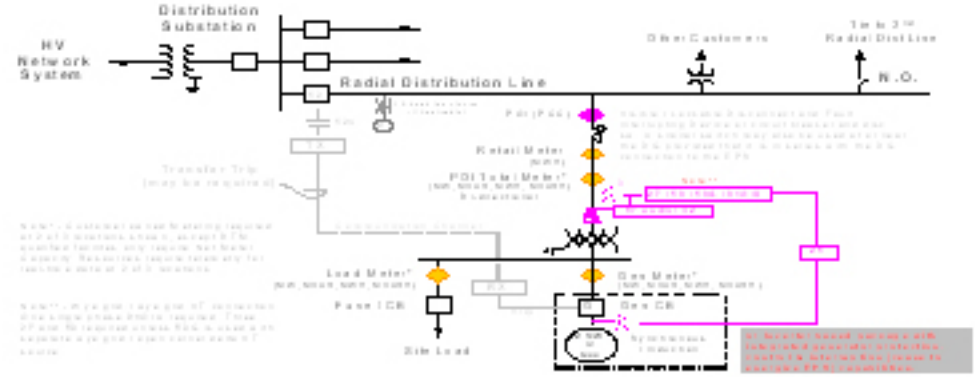
Non-islanding functionality test – An IEEE test to determine the ability of the device to meet IEEE requirements.

Off-peak – A period of low system demand on the electric power system.

Ohm (Ω) – The amount of resistance overcome by one volt in causing one ampere to flow; the ohm measure of resistance to current flow in electric circuits.

On-line – A generator on an electric power system that is operating. When an operational generator is not on-line, it is said to be "down."

One-line diagram – A diagram that shows, by means of lines and graphic symbols, the connection between a proposed installation of a Distributed Resource and the EPS. The one-line diagram should illustrate not only the proposed interconnection but also the type and size of the generator, system voltage, service entrance equipment at the facility, transfer switch and/or switchgear, protection and metering of current transformers and voltage transformers, protective relaying, and control for the generator and interconnection system sufficient to communicate to a qualified engineer the essential design and safety of the system being considered.



Other unintentional islanding functionality tests – Under Std 1547, if tests for reverse-power, minimum power, or non-islanding functionality are not applicable to the Distributed Resource Interconnection System, the manufacturer's or installer's tests should be used.

Outage – A temporary suspension or interruption of operation, especially of electric power, occurring when a power plant, transmission or distribution line, or other facility on the electric power system is not operating.

Parallel – paralleling device – A device on the Interconnection System of a Distributed Resource to allow it to operate in conjunction with the EPS. The paralleling device must be tested on the open circuit to confirm compliance with IEEE standards.

Peak load – The amount of power drawn from an electric power system at the time of highest demand, measured in kilowatts or megawatts.

Peaking – The condition where a generating unit is operating to provide the maximum power it is capable of producing. A generating unit that is capable of the efficient production of peaking power is characterized as a "peaking unit."

Periodic interconnection tests – Under Std 1547, all interconnection protective functions and storage devices are required to be tested periodically and reports or logs are to be maintained for periods of time recommended by the manufacturer, the installer, or any authority having legal jurisdiction over the interconnection.

Photovoltaic – Capable of producing voltage when exposed to radiant energy, especially light.

Point of common coupling (PCC) – The point at which the distributed generation facility is connected to the shared portion of the utility system.

Point of distributed resources connection – The place on an EPS where a Distributed Resource is connected electrically.

Power – The term used for the product of voltage and current measured in watts.

Power inverters – A device or system that can change direct current power (DC) to alternating current power (AC) (see inverter). Under Std 1547 standards, a distributive resource interconnection using an inverter that produces voltage before it reaches a paralleling device must be tested with an IEEE procedure required for synchronous operation. All other Distributed Resources using an inverter must be tested for their maximum current produced at start-up so that a calculation can be made regarding the ability of the Distributed Resource to meet IEEE synchronization and flicker requirements.

Power quality – Voltage deviations, harmonic distortions, and power interruptions experienced by a Customer or the EPS that can damage or adversely affect operations of the customer's equipment or equipment on the EPS.

Primary distribution systems – A portion of the EPS distribution system with nominal voltage ratings generally between 2.4kV and 34.5kV.

Primary network – A primary distribution system where circuits are simultaneously connected to two or more substation sources.

Production tests – Under Std 1547, each interconnection system shall be subjected to requirements limiting voltage and frequency when limits are exceeded and be tested at adjustable set points as specified by the Distributed Resource manufacturer, either as a test during the manufacturing process or as a commissioning test.

Protection from EMI – A characteristic of the Interconnection System that allows it to withstand electromagnetic interference (EMI) such that there is no harm to the performance or condition of the Interconnection.

Public utility commission – A government body with the legal authority to regulate aspects of public utility service, for example the Public Utilities Commission of Ohio (PUCO).

Rating – As in "nameplate" rating, is the gross rating on the manufacturer's nameplate as designated by the manufacturer of the generator. The nameplate rating does not take into account the actual consumption of the electric power of a generator or a generating facility.

Reactance – Opposition to the flow of alternating current in a circuit or circuit element, caused by inductance or capacitance.

Reclosing – Automatic closing of breakers subsequent to opening due to fault detection. Time delays before automatic closing range from instantaneous (no intentional delay) to tens of seconds. Under IEEE 1547, prior to reclosing by the EPS of a circuit to which a Distributed Resource is connected, the Distributed Resource is required to cease energizing the EPS. The Interconnection System design is to verify or ensure the Distributed Resource Interconnection System is coordinated with the EPS reclosing practices.

Rectifier – A device, as a diode, that converts alternating current to direct current.

Response to Area EPS abnormal conditions – When abnormal conditions occur on the EPS, the interconnected Distributed Resource must respond to voltage and frequency parameters at the point of common coupling to avoid harm to the utility company maintenance workers, the general public, the equipment connected to the EPS and the Distributed Resource itself.

Reverse-power or minimum power test – Under Std 1547, a reverse-power or minimum power test, if they are used unintentional islanding, the Distributed Resource is to be tested using injection or the Distributed Resources output and local loads are to be adjusted in order that reverse power or minimum power requirements can be met.

Remedial action – Action taken to correct or rectify a problem detected by tests or other observation or reported circumstances.

Secondary distribution systems – A portion of the EPS distribution system with nominal voltage ratings generally at 480 volts or less.

Secondary network – A secondary distribution system simultaneously supplied from two or more transformers, each connected to different primary distribution circuits.

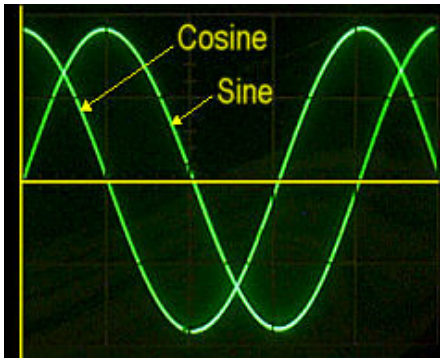
Self-excited induction generators testing – Under Std 1547, this test shall determine the maximum start-up current required by the Distributed Resource; see induction interconnection.

Service entrance – Customer's wiring from a point of attachment or termination of the service lateral line to and including the main service switch on the customer's premises.

Short circuit contribution – The result of dividing the maximum short circuit contribution of the distributed generator(s) by the short circuit contribution available from the utility system without the distributed generator(s), converted to a percentage.

Simulated utility – Test equipment with variable frequency and variable voltage installed to imitate a normal EPS.

Sine wave – In the science of physics, a waveform with a deviation that can be expressed as the "sine" or "cosine" of a linear function of time or space or both.



Single-phase power – An electric circuit that consists on one alternating current.

Solar power – Energy from the sun's radiance converted into heat or electricity.

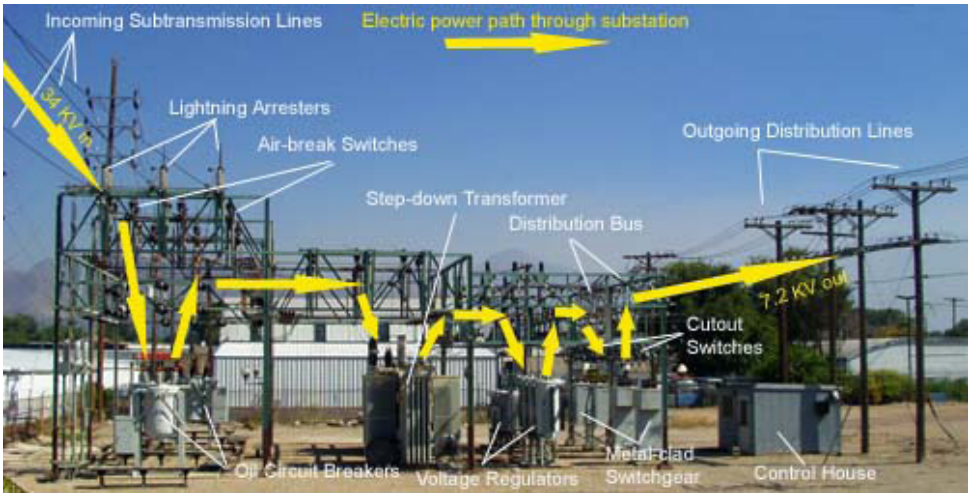

Solar Array at an Ohio school

Spot network – A secondary network with all supply transformers bussed together on the secondary side at one location. Under Std 1547, the interconnection of a Distributed Resource to a spot network is not permitted to cause any network protection devices to operate nor to prevent the reclosing of any such network protection device located on the spot network. The interconnection of a Distributed Resource to a spot network that allows load to be transferred between the EPS and the Distributed Resource shall meet distribution secondary spot network requirements regardless of the length of time the Distributed Resource operates in conjunction with the EPS.

Static power inverter – A device capable of changing the nature of stationary electrical charges.

Standard – An acknowledged measure of comparison for value, a level of requirement, excellence, or attainment.

Substation – A place on an electric power system that contains transformers to lower the voltage from a transmission level to a primary distribution system level.



Surge – A sudden, transient increase in the flow of electricity.

Surge withstand performance – Under Std 1547, the interconnection system must be able to withstand surges in voltage and in current within certain limits set by IEEE.

Synchronous – Set to operate at the same timing, speed, rate, frequency, or other measure.

Synchronization – The act of causing to coincide with an action. Under Std 1547, the synchronization of a Distributed Resource operating in conjunction with the EPS is not permitted to cause fluctuation of voltage at the point of common coupling greater than plus or minus 5 percent of the voltage level of the EPS and must meet the IEEE flicker requirements.

System demand – The total amount of energy required to supply all consumers.

Testing – Conducting an examination, trial or proof, often for the purpose of achieving a score, rating, or diagnosis.

Tests – More than one means of examination, trial, or proof.

Three –phase power – An electric circuit that consists of three separate currents delivered at one-third cycle intervals as a means of a three-wire circuit.

Time of use meter – A meter that has the capability to register consumption and/or demand within specified periods of one hour or smaller in a given day.

Total demand distortion (TDD) – Under Std 1547, the calculation of the distortion of harmonic current as a percentage of maximum current for demand load over a specified period of time.

Total rated-current distortion (TRD) – Under Std 1547, the calculation of current harmonics created by a Distributive Resource operating to serve a balanced load relative to the a current demand of a test load or rated capability of the Distributed Resource to produce current.

Transformer – A device used to raise or lower voltage in electric distribution or transmission lines. A step-up transformer raises voltage and a step-down transformer lowers voltage.

Transmission – The transfer of electric current-usually in massive or bulk quantities of power, from a power plant on an electric power system to a destination that could be hundreds of miles away. Power flow can be in either direction.

Unintentional islanding functionality test – A commissioning test used to determine whether a Distributive Resource will cease to energize the interconnection with the EPS when an unintentional island occurs.

Visual inspection – The act of looking or seeing, with the possible aid of a lighting device, at a particular item to determine the condition of the exposed surface. Areas out of the line of sight or below the surface are not visible for purposes of the examination.

Volt – A unit of electromotive force. One volt, applied to a circuit with a resistance of one ohm (Ω), produces a current of one ampere. In the United States, electrical systems of most homes and offices are 110 volts.

Voltage – Electromotive force or potential difference that pushes electricity through a wire, usually expressed in volts. Under IEEE 1547, the Distributed Resource must be able to cease to produce voltage within required clearing times set by IEEE for the capacity (size) of the specific Distributed Resource installation.

Voltage regulation – Control of voltage within prescribed limits. Under Std 1547, a Distributive Resource is not to attempt to regulate voltage at the point of common coupling nor to cause the voltage on other parts of the EPS to exceed standard limits.

Watt – The electrical unit of power. The rate of energy transfer equivalent to 1 ampere flowing under a pressure of 1 volt at unity power factor

Wattage – An amount of power, especially electric power, expressed in watts or kilowatts.

Wind powered energy systems – "Wind-powered energy system" means any wind-powered devices which supplement or replace electrical power supplied to households or businesses at the immediate site.