



GLOSSARY OF TERMS

For Electric Utility Personnel

UMW APDA DTEC

THIS GLOSSARY OF TERMS WAS COMPILED BY THE UPPER MIDWEST AMERICAN DISPATCHERS ASSOCIATION TO FURTHER EXPEDITE A COMMON TERMINOLOGY AMONG PERSONNEL WITHIN THE ELECTRIC INDUSTRY.

Don Zvacek	Iowa Electric Light and Power
Gary Graham	Mid-Continent Area Power Pool
Mike Critchley	Minnesota Power
Ben Deutsch	Northern States Power
Jim DeCourcy	Northern States Power
Vern Drechsel	Otter Tail Power
Rich Hendrickson	United Power Association

DEDICATED TO ALL POWER SYSTEM OPERATORS

IN 1987 THIS GLOSSARY WAS REVISED TO EXPAND SEVERAL SECTIONS, ADD A NUCLEAR SECTION AND PLACE THIS INFORMATION ON COMPUTER. THE UPPER MIDWEST AMERICAN POWER DISPATCHERS ASSOCIATION TRUSTS THAT THESE CHANGES MEET WITH YOUR APPROVAL.

Loren Moxness	Otter Tail Power
John Heino	Minnesota Power
Paul Beaudry	United Power Association
Carol Elrod	Lincoln Electric System
Fred Scheerer	Omaha Public Power District
Ben Deutsch	Northern States Power
Ken Creamer	ENEREX

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GENERATION

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<u>Air Preheater</u> APH	Auxiliary heating surface where incoming air is warmed with exhaust gasses.
<u>Amplidyne</u> AMPL	A trade name of a particular voltage regulator, used with a generator.
<u>Ash Hopper Bottom</u>	Collection point at bottom of boiler to store ash until removed from boiler
<u>Attemperator</u> ATT	Device that maintains steam temperature entering turbine below maximum limits.
<u>Auxiliary Transformer</u> AUX	A transformer that supplies power to motors, pumps, fans, lighting, etc.
<u>Bearing</u> BRG	Device used to hold and maintain alignment of a shaft.
<u>Bearing – Guide</u>	A device to guide a machine element in its lengthwise motion usually without rotation of the element.
<u>Bearing – Journal</u>	Cylindrical support holding a rotating shaft.
<u>Bearing – Thrust</u>	A device to prevent lengthwise motion of a rotating shaft.
<u>Blowdown</u>	Small amount of water that is bled from the boiler to keep impurities in the boiler water at an acceptable amount.
<u>Boiler</u> BLR	Large furnace in which water filled tubes are heated to produce steam.
<u>Boiler Feed Pump</u>	Pump that supplies water to boiler for producing steam.
<u>Boiler Seal</u>	Trough of water located at bottom of boiler to seal combustion area of boiler.
<u>Brush</u>	A stationary conductor, usually carbon held in contact with a moving conductor.
<u>British Thermal Unit</u> BTU	It is defined as the quantity of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit.
<u>Burn Up</u>	Measure of nuclear reactor fuel consumption.
<u>Capability Curve</u>	A curve drawn to show the limits of reactive and kilowatt loads that a generator can tolerate without over heating or becoming unstable.

<u>Chain Reaction</u>	Reaction that stimulates its own repetition. In a nuclear chain reaction, a fissionable nucleus will absorb a neutron and split, releasing additional neutrons.
<u>Circulating Water Pump</u> CWP	Pump used to circulate cooling water through condenser tubes.
<u>Coal</u>	See fossil fuel.
<u>Coal Bunker</u>	Funnel shaped reservoir or storage bin to store fossil fuel before processing, prior to entering boiler.
<u>Coal Conveyor</u>	Device used to transport coal from yard to bunker in plant.
<u>Coal Feeder</u> CF	Device between bunker and mill that supplies and maintains proper coal level in mill.
<u>Co-Generation</u>	Combined production of electrical energy and useful thermal energy.
<u>Collection Ring</u>	A metal ring suitably mounted on an electric machine that (through stationary brushes bearing there on) conduct current into or out of the rotating member.
<u>Combustion Area</u>	Burning area of the boiler.
<u>Commutator</u> COMM	A ring of insulated copper segments connected to the windings of a rotating armature, and on which brushes make contact.
<u>Condenser</u> COND	Device used to change steam back to a liquid condensate form, and returned to boiler.
<u>Condensation</u> COND	When steam or any other vapor is subjected to a change of state which reduces it to a liquid, it is said to be condensed. Steam is condensed in a condenser or heater by extracting heat. The water is called condensate. Also Condensate.
<u>Condensate Pump</u> CP	Pump used to pump condenser condensate back to boiler.
<u>Control Rod</u>	Device used to control the power of a reaction in a nuclear power plant.

<u>Cooling Pond</u>	Body of water used to cool the warm water, discharge drum plant, before returning it to a river, lake, or plant.
<u>Cooling Tower</u> CT	Structure where plant discharge water is cooled by air before discharging to a cooling pond or returned to plant.
<u>Critical (Nuclear)</u>	Capable of sustaining a chain reaction.
<u>Critical Point</u>	The pressure (3208 psia) and temperature (705°F) at which all properties of water and steam are identical.. Increased pressure causes the steam to become more dense until it finally has the same density as water. No definite water level exists at this point.
<u>Crusher</u> CRSH	Usually a device for the first stage of conditioning coal prior to entering the coal bunker.
<u>Dearator</u>	Supply tank in which oxygen, a corrosive agent, is removed from feedwater before it enters the boiler feed pump.
<u>Demineralization System</u> DEMIN	Chemical process to condition water prior to entering boiler cycle. Also known as Demineralizer.
<u>Economizer</u> ECON	Heat exchanger located in the passage between the boiler and stack, designed to recover some off the waste heat from the products of combustion.
<u>Electrostatic Precipitator</u>	Equipment that utilizes an electrical field to collect particles of combustion from the flue gas.
<u>Ejector</u>	Device to remove air and noncombustible gasses from condenser.
<u>Engine</u> ENG	See Prime Mover.
<u>Enrichment</u>	Process by which U-235 content of uranium is increased for use as power plant fuel.
<u>Evaporator</u>	Removes impurities from water by evaporation, this is usually accomplished by the application of heat.
<u>Excess Air</u>	Amount of air supplied to boiler in excess of that theoretically required for complete combustion.

<u>Exciter</u>	A direct current generator that provides current for the field of an alternating current generator. It can provide DC current by use of a commutator or solid state diodes.
<u>Exhaust</u> EXH	Gas or vapor that is discharge to the atmosphere.
<u>Exhauster</u> EXH	A device that conveys pulverized fuel from the mill to the burner.
<u>Extraction</u>	A process by which a small part of steam from turbine at various stages before it has completely passed through it. Usually used to reheat feedwater as it returns to the boiler.
<u>Feeder</u> FDR	See Coal Feeder.
<u>Feed Water</u>	Water that is pumped to the boiler.
<u>Feed Water Heater</u>	A vessel where extraction steam is used to heat feed water.
<u>Field Breaker</u>	The switching device to open or close a generator field circuit. Must be closed to magnetize field.
<u>Field Strength</u>	The electromagnetic strength of the generator rotor when electrically energized.
<u>Fission</u>	Process by which heat energy is produced in a nuclear reactor.
<u>Flame Detector</u>	Monitors flame in boiler and will initiate fuel trip on improper or loss of flame.
<u>Flue Gas</u>	Gas formed by combustion of fuel.
<u>Fly Ash</u>	Residue of fossil fuel combustion which is removed form the exhaust gas by means of precipitators and/or scrubber systems.
<u>Forced Draft Fan</u> FDF	Fan that supplies the air at a positive pressure and forces it into the boiler.
<u>Fossil Fuel</u>	Fuel formed by the decomposition of vegetation which grew in prehistoric forest; e.g., coal, oil, and natural gas.
<u>Fossil Fuel Plants</u>	Electric generation which uses steam to drive turbine where coal, gas or petroleum is utilized to provide heat for the boiler.

<u>Frequency</u>	Alternation or changes in direction per unit of time. Often stated in cycles per second (Hertz).
<u>Fuel</u>	Consumable substance to produce heat energy which is transformed to kinetic energy in the steam turbine.
<u>Fuel Cycle</u>	Series of steps involved in supplying fuel for nuclear power reactors.
<u>Fuel Element</u>	Rod, tube, plate or other mechanical form containing nuclear fuel.
<u>Full ARC Admission System</u>	Process of warming turbine evenly before synchronizing generator to system.
<u>Fusion</u>	Controlled fusion is a form of nuclear energy that shares with fission the potential of providing a virtually inexhaustible source of fuel.
<u>Gas</u>	Fuel used for ignition in a combustion chamber.
<u>Gas Turbine Plants</u>	Characterized by using combustion products plus heated air as the working fluid which expands through the turbine.
<u>Gas Recirculating Fan</u>	Fan that recirculates flue gas through the boiler to assist in steam temperature control.
<u>Gate</u>	Devices used to control flow of a substance.
GT	
<u>Generator</u>	See preface on generators.
GEN	
<u>Geothermal</u>	Electric generation in which heat from molten rock within the earth is used to produce steam.
<u>Governor</u>	Device that attempts to maintain generator at a constant speed.
GOV	
<u>Half-Life</u>	Time in which half the atoms of a particular radioactive substance disintegrate to another form.
<u>Heat Rate</u>	Measure of generation station efficiency. Total BTU content of the fuel burned by the resulting net kilowatt-hour generation.
<u>Hertz</u>	Unit of frequency, one cycle per second.
<u>Hotwell Pump</u>	See condensate pump.
<u>Hydroelectric Plants</u>	Electric generation which is produced by the water flow through the turbine.

<u>Hydrogen-Cooled Machine</u>	A machine that is cooled by hydrogen gas circulation.
<u>Hydrogen Cooler</u>	Heat exchanger to remove heat from hydrogen gas.
<u>Hydrostatic Test</u>	A strength and/or leak accomplished by pressurizing equipment or systems with water.
<u>Igniter</u>	Device used to ignite fuel on entry to the combustion chamber.
<u>Implosion</u>	An inward bursting of a tank or pipe when the pressure on the outside of the tank or pipe is higher and the vessel cannot withstand the pressure difference.
<u>Induces Draft Fan</u> IDF	Fan that remove combustion gasses from the boiler and discharges gasses into the stack.
<u>Kinetic Energy</u>	Energy that a body has due to its motion. A flywheel has kinetic energy due to the motion of its heavy rim. Doubling the velocity of a body makes its kinetic energy four times as great.
<u>Lead Time</u>	Time required to place generator in service.
<u>Limitorque Motor</u>	Motor between the control circuits and the hydrogates that regulates the opening of the hydrogates.
<u>Magnetic Coupling</u>	Devices used for speed control on auxiliary equipment (FDF & IDF).
<u>Mill</u>	Auxiliary equipment where coal is reduced to a powdery consistency prior to entry to combustion chamber of boiler. Also known as Pulverizer.
<u>Opacity</u>	A visual measure of the ash particles leaving the stack.
<u>Pilot Exciter</u>	A small direct current generator that furnishes excitation for the main exciter. Usually the main exciter has enough residual magnetism so that a pilot exciter is not required.
<u>Plant Heat Rate</u>	(BTU/KWH) A measure of plant performance that is the ratio of the input energy to the power output.
<u>Power</u>	Power is the time rate at which work is done. Foot pounds express work, but the time rate required determines the power; 33,000 foot pounds per minute is one horsepower.

<u>Power System Stabilizer</u>	A device that dampens the oscillations of a power system.
<u>Precipitator</u>	See Electrostatic Precipitator.
<u>Preheater</u>	Section of boiler where incoming air is heated by the exiting hot gasses.
<u>Primary Air Fan</u>	Device which mixes combustion air with pulverized fuel and conveys this mixture to the boiler for combustion.
<u>Prime Mover</u>	Equipment utilized to deliver energy to turn electrical generator.
	See Appendix I.
<u>Pulverizer</u>	See Mill.
<u>Reactor</u>	Vessel which contains the nuclear materials used for production of steam.
<u>Reactor – Boiling Water</u>	System in which water is allowed to boil. Steam can be used directly to drive a turbine.
<u>Reactor – Breeder</u>	Reactor that creates more fissionable fuel than it consumes.
<u>Reactor – Liquid Metal</u> LMFBR	Uses liquid metal such as sodium as a coolant reaction takes place with little or no moderating substance to slow process.
<u>Reactor – Light Water</u> LWR	Reactor system that used ordinary water in the reactor to slow down the high velocity neutrons, thus increasing the likelihood of further fission.
<u>Reactor – Pressurized Water</u> PWR	Heat is transferred from the core to a heat exchanger. Water is kept under high pressure to permit transfer of heat without boiling taking place in the primary system (inside core).
<u>Reclaimer</u>	A reclaim belt or reclaim hopper is a part of the coal handling equipment to transport coal from the storage pile into the plant.
<u>Refractory</u>	Material used to insulate the outside and between fire wall tubes of the boiler.
<u>Reheat</u>	Term used to describe the process of adding heat to steam after it has done some work in the turbine; it is returned to the boiler for reheating then returned to the turbine to perform additional work.

<u>Relief Valve</u>	Utilized in a power plant to prevent damage to the equipment. Should a piece of equipment rise in pressure above a preset point, the valve will open.
<u>Reserve</u>	Standby equipment not in operation.
<u>Rheostat</u>	Variable resistance with one fixed terminal and one variable contact. Device that control current flow by changing resistance.
<u>Rod (Nuclear)</u>	Fuel or control element within a nuclear reactor. Each fuel rod is composed of nuclear material pellets.
<u>Rotor</u>	Rotating part of a generator, often called the field. Usually the magnetic portion of the generator.
<u>Safety Valve</u>	Valves on boilers used to relieve over-pressurization of boiler.
<u>Saturated Steam</u>	Steam that contains moisture; and yet if heat were added, its temperature would increase.
<u>Scrubber</u>	A pollution control device which removes both sulfur dioxide and particulate (fly ash particles) from flue gas.
<u>Sensible Heat</u>	Part of heat absorbed by a liquid which produces a change in temperature as indicated by a thermometer.
<u>Shrink</u>	Decrease in water level caused when boiling is stopped in a vessel.
<u>Slag</u>	Residue ash which accumulates in boiler and which must be removed.
<u>Slip Ring</u>	Device for making electrical connections between a rotor and brushes to connect it with outside circuits.
<u>Sludge</u>	Refuse from a flue gas scrubber.
<u>Soot Blower</u>	Device used to remove accumulation of slag from boiler tubes and heating surfaces.
<u>Specific Heat</u>	Different substances have different heat capacities. Specific heat of any substance is the heat required to raise 1 pound of it one degree Fahrenheit.

<u>Stack</u>	Sometimes call a chimney. A tall cylinder of steel and concrete through which the products of combustion from a steam generator are discharged to the atmosphere.
<u>Stator</u>	The portion that includes and supports the stationary active parts. The stator includes the stationary portions of the magnetic circuit and the associated winding and leads. It may, depending on the design, include a frame or shell, winding supports, ventilation circuits, coolers, and temperature detectors. A base, if provided, is not ordinarily considered to be part of the stator.
<u>Supercritical</u>	Combination of pressure and temperature, both of which are above the critical point. See definition of critical point.
<u>Superheated Steam</u>	Steam that has been raised to a temperature higher than the boiling temperature corresponding to the boiling pressure.
<u>Superheater</u>	Area of boiler where steam is raised to a higher temperature than the boiling temperature.
<u>Swell</u>	Increase in water level caused when boiling is initiated or increased in a vessel.
<u>Synchroscope</u>	Electrical device that compares phase difference of the system and that of the plant or generator.
<u>Synchronizing</u>	The process whereby a synchronous machine, with its voltage and phase suitably adjusted, is paralleled with another synchronous machine or system.
<u>Temperature</u>	Thermal pressure or intensity of the heat contained within a body. Things that determine the temperature of a body are the heat (BTUs) added, the ability of the substance to give or receive heat from another body, the initial temperature and the specific heat of the substance. Or – a numerical value which is a measure of the hotness of a body.
<u>Throttle</u>	Valves used on a turbine to vary the steam flow to the turbine and therefore the generator output.
<u>Trap</u>	Device placed in pipelines to permit water to pass

	through but to prevent gasses such as air and steam from passing through.
<u>Turbine (Steam)</u>	Heat engine that converts heat energy into mechanical energy. Make use of the fact that steam when issuing from a small opening attains a high velocity.
<u>Turbine Heat Rate</u>	Measure of turbine, condenser, and feed water heater performance, which is the ratio of the number of heat units supplied to the turbine in the steam to the power output of the turbine.
<u>Unit Trip Relay</u>	Protective relay that separates turbine-generator from system, shuts off fuel to boiler and transfers station auxiliaries to reserve source of power.
<u>Uranium</u>	Heavy, naturally radioactive metal. Indispensable to industry because it is the only isotope existing in nature that is fissionable.
<u>Vacuum</u>	Pressure less than atmospheric pressure (14.7 PSI). Usually measure in inches of mercury.
<u>Vacuum Breaker</u>	Device that operates to prevent the formation of a vacuum by supplying air or some other substance to the low pressure zone.
<u>Vaporize</u>	To turn a liquid into a gas or vapor.
<u>Water Hammer</u>	Internal vibration and banging that may occur in equipment and piping.
<u>Wet Steam</u>	Steam which contains particles of water that have not been evaporated.

GENERATORS

Electric power is produced in a generator by rotating a magnet inside of a coil of wire.

Electric Generators for steam and Gas Turbines usually are driven in the United States at 1800 or 3600 rpms.

Nearly all alternating current generators are three phase, except for small portable units. Three phase is used because more power can be generated for the same amount of winding than with single phase.

Basic Parts of the Electric Generator:

- A. Stator: Stator is the stationary part of the generator. Wires (windings) that are to be cut by magnetic flux are mounted in slots in the stator core. The windings are insulated and held in place in the slots by wooden or micarta wedges.
- B. Stator Core: Made of laminated iron, that is, thin iron punchings pressed tightly together and held through bolts or bolted clamping fingers. Notches are cut in the punchings so that when they are all lined up and clamped together the notches form slots for the winds. Each thin punching is insulated from the other by a thin varnish film.
- C. Stator Windings: Carry the total electrical power produced by the generator. Conductors must be large enough to carry the load current without over-heating. Size of conductors determines the generator rating.
- D. Stator Winding Insulation: Must be electrically insulated for whatever voltage is used. Each conductor is individually taped and then laid together to form a coil side.
- E. Stator Cooling: Lead current flowing through the stator windings produces heat. Heat is also produced in the iron core by action of magnetic fields. To remove this heat several types of cooling systems have been developed.
 1. Open System: Windings are not enclosed. Usually fans are built onto the rotor to blow air through the generator.
 2. Filtered Air Cooled: Outside air is drawn through a filter by fan action. The cool filtered air then is passed through the generator and discharged outdoors. Louvers must be provided so that air flow can be adjusted.

3. Totally Enclosed Air Cooled: Air blown through the generator carries the heat down into a wind box under the generator. In the wind box the hot air passed over pipes filled with cold water.
4. Hydrogen Cooling: Generator has shaft seals at each of the two end shields to prevent the escape of hydrogen from the generator casing. Pure hydrogen is used (75% is minimum) for cooling. Care must be taken to maintain correct pressure, temperature and purity of the gas in order to have effective cooling.

Before entering generator, all hydrogen must be removed by the use of carbon dioxide.

- F. Rotor: Rotating part of the generator. This part is also called “Field” because it is the electromagnet that makes the magnetic field of flux lines which cut the stator wires.

Direct current is fed into the field windings by means of slip rings and brushes. Direct current is supplied by the exciter which is a direct current generator.

Two main types of rotors:

1. Salient Pole Rotor: Magnetic poles with their windings are bolted to the outside rim of a large spider.
 2. Turbo Type Rotor: This type is longer and cylindrical and relatively smooth. It is used for 1800 or 3600 rpm generators. Since it is smaller in diameter, it develops less centrifugal force.
- G. Rotor Prewarming: Steel is stronger when it is warm so for some generators it is necessary to prewarm the rotor before bringing it up to full speed. Accomplished by applying field current to the rotor while the unit is being slowly brought up to speed. The field current in this case must be supplied by the motor driven reserve exciter.

Exciters and Direct Current Generators: An exciter is a direct current generator that provides current for the field of an alternating current generator.

In most alternating current generators, the main output windings are stationary being placed in the stator while the magnetic field poles revolved inside the windings.

In a direct current generator, the magnetic field poles are stationary while the output windings revolve inside the field poles. The rotating part of a DC generator is called an “armature.”

A *Pilot Exciter* is a small direct current generator that furnished excitation for the main exciter.

A *Reserve Exciter* is a motor or steam turbine driven exciter that can supply a generator’s field current if for any reason the shaft driven exciter fails. Reserve is usually a full rated exciter that is the same size as the shaft driven exciter so that AC generator can deliver normal output.

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TURBINES

Two Basic Types of Steam Turbines:

- A. Condensing: Exhaust steam from the turbine cannot be utilized and power must be generated on a minimum amount of steam.
- B. Noncondensing: Used when all, or practically all, the exhaust steam from the turbine can be used for process or heating.

Two Basic Types can be Further Sorted According to Steam Flow in Turbine:

- A. Straight-Flow: Use of full throttle steam from nozzles to exhaust.
- B. Reheat: Main steam flow exhausts from the turbine at an intermediate stage.
- C. Automatic-Extraction: Turbine bleeds off part of the main steam flow at one, two or three points. Valved partitions between selected turbine stages control extracted-steam pressure at the desired pressure.
- D. Nonautomatic-Extraction: Turbine bleeds steam at as many as nine different stages. Pressure of extracted steam at each stage varies with the turbine shaft load.

Basic Types of Hydraulic Turbines:

- A. Impulse (Pelton): Usually has a horizontal shaft and a single horizontal jet.
- B. Reaction: In both types listed below the water passages are completely filled with water.
 - 1. Francis: Water flows from the scroll case to the runner through guide vanes which impart tangential velocity. Used with heads up to 1200 feet.
 - 2. Propeller: Fixed or adjustable (Kaplan) blade types. Speed of water is increased by use of this type. Maintains more efficient conditions. Used on heads up to 150 feet.

TRANSMISSION AND SUBSTATIONS

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<u>Air Break Switch</u>	A switch whose contacts are opened in air.
ABS	Usually manually operated and equipped with arcing horns. Ordinarily used to disconnect one section of line from another.
<u>Ammeter</u>	A meter placed in a circuit that measures the number of amperes of electric current flowing in a circuit.
<u>Arcing Contacts</u>	Contacts on which an arc is drawn after the main contacts of a switch or circuit breaker have been parted.
<u>Arcing Horn</u>	See arcing contacts.
<u>Autotransformer</u>	A transformer in which the primary and secondary have a common winding.
<u>Auxiliary Bus</u>	See transfer bus.
<u>Bus</u>	An electric conductor which serves as a common connection for two or more electrical circuits.
<u>Capacitor</u>	A device used for power factor improvement...capable of storing a charge of electricity and returning it to the line.
CAP	
<u>Circuit Breaker</u>	A device for interrupting an electrical circuit between separable contacts under normal and abnormal conditions. May be operated manually or automatically for circuit control by overload or other selected conditions.
<u>Conductor</u>	Metallic link used as an electrical circuit.
<u>Constant Current Transformer</u>	A transformer which, when supplied from a constant potential source, automatically maintains a constant current in its secondary under varying load conditions.
<u>Contact</u>	An electrically operated device for energizing and de-energizing electrical equipment...usually low voltage.
<u>Core</u>	A mass of iron placed inside a coil to decrease the reluctance to magnetic lines of force.
<u>Corona</u>	A phenomenon which occurs around a conductor when the potential is raised above the dielectric strength of the surrounding air. It appears as a bluish discharge around the conductor with occasional streamers into the surrounding air.

<u>Current Transformer</u> CT	A small transformer which makes it possible to measure current in a high voltage line using a small ammeter.
<u>Cut Out</u>	A transformer fuse. Called a cut out because when the fuse is removed the circuit is opened.
<u>Delta</u>	A type of connection for a three-phase electrical machine or for transformer windings.
<u>Demand Meter</u>	A meter used to record the greatest amount of power used over an interval of time of a prescribed length. Usually 15, 30, or 60 minutes.
<u>Disconnect Switch</u>	A type of air break switch not equipped with arcing horns. It cannot be used to open circuits while current is flowing. A switch used to give visual clearance when isolating electrical equipment.
<u>Distribution Panel</u>	An electric panel with circuit breakers which energize other panels or circuits.
<u>Dry-Type Transformer</u>	A transformer which operates without oil as a cooling medium and designed with insulation to withstand high temperature.
<u>Eddy-Current Loss</u>	Loss in the core of a transformer due to currents being induced in and flowing around core. Also induced in conductors where it causes heating.
<u>Electrical Operation</u>	A switch or circuit breaker power operated by electricity. Manual operation of a breaker is operated by hand without the use of any other power source.
<u>Enclosed Bus</u>	A bus having its conductors enclosed in an insulating or metal enclosure.
<u>Extra High Voltage</u> EHV	Voltage in excess of 345 KV.
<u>Fault</u>	A partial or total failure in the insulation or continuity of a conductor.
<u>Feeder</u>	A conductor or group of conductors connecting two generating stations, two substations, a generating station and a substation or feeding point or a substation and a feeding point.
<u>Fuse</u>	A part of a circuit made of a low melting point material so that it will melt and break the circuit when a specified current is exceeded. It is always the weakest point in a circuit.

<u>Gang Operated Air Break</u>	A horn gap type switch manually operated from the ground.
GOAB	
<u>Ground Bus</u>	A bus used to connect a number of grounding conductors to one or more grounding electrodes.
<u>Ground Current</u>	A system of conductors in which at least one conductor (usually in the middle wire of neutral point of transformer or generator windings) is intentionally grounded either solidly or through a current limiting device.
<u>Grounding Switch</u>	A switch by means of which a circuit may be connected to ground.
<u>Grounding Transformer</u>	A transformer intended primarily for developing a neutral point for grounding purposes.
<u>High Side</u>	The higher voltage electrical system of two systems connected by a transformer.
<u>High Voltage</u>	Above 600 volts.
<u>Hysteresis</u>	Loss in the core of a transformer due to molecular friction.
<u>Instrument Transformer</u>	Used for measuring and control purposes. Provides currents and voltage representative of the primary components but of such magnitude that there is less danger to instruments and personnel.
<u>Insulator</u>	A medium or material that resists the flow of electronics.
<u>Interlock</u>	An arrangement that keeps one operation or sequence of operations from taking place until another condition has been satisfied.
<u>Lightning Arrestor</u>	Provides a path to ground when voltage on a line becomes greater than the normal voltage.
<u>Loop Feeder</u>	Consists of a number of tie feeders in series forming a closed loop.
<u>Meter Loop</u>	Wiring within the meter fixture...includes wiring to meter transformers.
<u>Oil Circuit Breaker</u>	A switch that is immersed in oil to help break the circuit and quench the arc when operated.
<u>Oil Switch</u>	See oil circuit breaker.

<u>Overload Indicator</u>	A red light and a dial on a transformer that indicates that the transformer has been overloaded and the number of times it has been overloaded. Can be reset to zero.
<u>OCB Control</u>	The handle on the control panel which, when operated, will cause the OCB to open or close.
<u>Pothead</u>	Used where underground cables terminate at buses or on pole tops to prevent moisture from entering the cable. Also a point where separate or overhead conductors come together and continue as a cable.
<u>Potential Transformer</u> POT	A small capacity transformer used to supply reduced voltage to voltmeters, wattmeters and oil switches.
<u>Primary Cut Out</u>	See cut out.
<u>Primary Winding</u>	The winding of a transformer to which the electrical energy is supplied.
<u>Rated KVA of a Transformer</u>	The output which can be delivered for the time specified at rated secondary voltage and rated frequency without exceeding the specified temperature limitations.
<u>Ratio of a Transformer</u>	The turns ratio between the windings of a transformer unless otherwise specified.
<u>Rating of a Transformer</u>	A designated limit of operating characteristics based on definite conditions.
<u>Rectifier</u>	A device which converts alternating current into unidirectional current by permitting flow in only one direction.
<u>Rheostat</u>	An adjustable resistor so constructed that its resistance can be changed without opening the circuit in which it is connected.
<u>Secondary Winding</u>	The winding of a transformer from which the load is supplied.
<u>Selector Switch</u>	A form of air switch arranged so that a conductor may be connected to any one of several other conductors.
<u>Step Regulator</u>	See tap changer.
<u>Tap Changer</u>	A method of changing voltage by changing the number of turns in the secondary winding of a transformer.

Transfer Bus	An electrical path used to transfer current, by-passing primary equipment normally in service. Also aux bus.
Transformer	A device for transforming the voltage of an electric current to a higher or lower voltage.
Voltage Regulator	A device used to maintain constant voltage on an alternating current feeder with variations in load.
Voltmeter	A meter that reads the pressure that caused the current to flow in a circuit.
Wye	Star or Y connection of a three phase electrical machine or transformer windings.

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RELAY

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<u>Accelerating Relay</u>	A programming relay whose function is to control the acceleration.
<u>Active-Power Relay</u>	A power relay that responds to active power. See also: power relay, reactive power relay.
<u>Actuation Time, Relay</u>	See relay actuation time.
<u>Actuator, Relay</u>	See relay actuator.
<u>Add and Subtract Relay</u>	A stepping relay that can be pulsed to rotate the movable contact arm in either direction. See also: relay.
<u>Adjustment, Relay</u>	See relay adjustment.
<u>Air Gap, Relay</u>	See relay air gap.
<u>Alarm Relay</u>	A monitoring relay whose function is to operate an audible or visual signal to announce the occurrence of an operation or condition needing personal attention, and usually provided with a signaling cancellation device. See also: relay.
<u>Amplifier, Relay</u>	See relay amplifier.
<u>Annunciator Relay</u>	A relay that indicates visually whether current is flowing or has flowed in one or more circuits. See also: relay.
<u>Antifreeze Pin, Relay</u>	See relay antifreeze pin.
<u>Approach-Lighting Relay</u>	A relay used to close the lighting circuit for signals upon the approach of a train.
<u>Armature, Relay</u>	See relay armature.
<u>Automatically-Reset Relay</u>	See self reset relay.
<u>Automatic-Reset Relay</u>	See relay, automatic-reset.
<u>Auxiliary Relay</u>	A relay whose function is to assist another relay or control device in performing a general function by supplying supplementary actions.
<u>Auxiliary Relay Driver (Relaying)</u>	A circuit which supplies an input to an auxiliary relay.
<u>Back Contact (Relaying)</u>	A contact which is closed when the relay is reset. A contact that is closed when the relay is de-energized.

<u>Backstop, Relay</u>	See relay backstop.
<u>Backup Protection</u>	A form of protection that operates independently of specified components in the primary protective system and that is intended to operate if the primary protection fails or is temporarily out of service.
<u>Balance Beam (Relay)</u>	A lever form of relay armature, one end of which is acted upon by one input and the other end restrained by a second input.
<u>Balance Relay</u>	A relay that operates by comparing the magnitudes of two similar input quantities.
<u>Bearing Temperature Relay</u>	A relay whose temperature sensing element is mounted at or near the bearing surface.
<u>Block (Relaying)</u>	An output signal of constant amplitude and specified polarity derived from an alternating input and with the duration controlled by the polarity of the input quantity.
<u>Block-Block Element (Relaying)</u>	A signal element in which two blocks are compared as to coincidence or sequence.
<u>Blocking (Relay System)</u>	A relaying function which prevents action that would otherwise be initiated by the relay system.
<u>Blocking Relay</u>	An auxiliary relay whose function is to render another relay or device ineffective under specified conditions.
<u>Brush, Relay</u>	See relay wiper.
<u>Buffer, Relay</u>	See relay spring stud.
<u>Bunching Time, Relay</u>	See relay bunching time.
<u>Burden Relay</u>	Load impedance imposed by a relay on an input circuit expressed in ohms and phase angle at specified conditions. NOTE: If the burden is expressed in other terms such as volt-amperes, additional parameters such as voltage, current, and phase angle must be specified.
<u>Bushing, Relay</u>	See relay spring stud.
<u>Card Extender, Relaying</u>	A device for testing static relay (circuit) cards which provide access to components on the card while maintaining all the electrical connections to the card.
<u>Card, Relay</u>	See relay armature card.

<u>Carrier-Pilot Protection (Relays)</u>	A form of pilot protection in which the communication means between relays is a carrier current channel.
<u>Carrier Relaying Protection</u>	A form of pilot protection in which high-frequency current is used over a metallic circuit for communicating means between the relays at the circuit terminals.
<u>Centrifugal Relay</u>	An alternating-current frequency-selective relay in which the contacts are operated by a flyball governor or centrifuge driven by an induction motor.
<u>Chatter, Relay</u>	See relay chatter time, relay contact chatter.
<u>Coaxial Relay</u>	A relay that opens and closes an electric contact switching high—frequency current as required to maintain minimum losses. See also: relay.
<u>Conductance Relay</u>	A mho relay for which the center of the operating characteristic on the R-X diagram is on the R axis.
<u>Contact Chatter, Relay</u>	See relay contact chatter.
<u>Contact Converter (Relays)</u>	A buffer element used to produce a prescribed output as the result of the opening or closing of a contact.
<u>Contact Current-Carrying Rating (Relay)</u>	The current that can be carried continuously, or for stated periodic intervals, without damage to contact structure. See also: relay.
<u>Contact Current-Closing Rating (Relay)</u>	The current that the device can close successfully with prescribed operating duty and circuit conditions without significant impairment of the contact structure. See also: relay.
<u>Contact Follow-Up (Relays)</u>	The distance between the position one contact face would assume, were it not blocked by the second contact, and the position the second contact face would assume were the first contact removed, when actuating member is fixed in its final contact closed position.

<u>Contact Interrupting Rating</u>	The current that the device can interrupt successfully, with prescribed operating duty and circuit conditions without significant impairment of the contact structure. See also: relay.
<u>Contact Nomenclature</u>	See relay terms.
<u>Contact Opening Time (Relay)</u>	The time a contact remains closed, while in process of opening, following a specified change of input.
<u>Control Relay</u>	An auxiliary relay whose function is to initiate or permit the next desired operation in a control sequence.
<u>Correct Relaying-System Performance</u>	The satisfactory operation of all equipment associated with the protective relaying function in a protective-relaying system.
<u>Correct Relay Operation</u>	An output response by the relay which agrees with the operating characteristic for the input quantities applied to the relay.
<u>Coupling Capacitor</u>	A capacitor employed to connect the carrier lead-in conductor to the high-voltage power transmission line. See also: power line carrier.
<u>Critical Impulse (Relay)</u>	The maximum impulse in terms of duration and input magnitude that can be applied suddenly to a relay without causing pickup.
<u>Critical Impulse Time (Relay)</u>	The duration of a critical impulse under specified time.
<u>Critical Overtravel Time (Relay)</u>	The time following a critical impulse until movement of the responsive element ceases just short of pickup.
<u>Critical Travel (Relay)</u>	The amount of movement of the responsive element of a relay during a critical impulse, but not subsequent to the impulse.
<u>Current-Balance Relay</u>	A relay that operates by comparing the magnitudes of two current inputs. See also: relay:
<u>Current Derived (Relaying)</u>	A voltage produced by a combination of currents.

<u>Current Rating (Relay)</u>	The current at specified frequency that may be sustained by the relay for an unlimited period without causing any of the prescribed limitations to be exceeded.
<u>Current Relay</u>	A relay that responds to current. See also: relay.
<u>Current Transformer</u>	Intended to have its primary winding connected in series with the conductor carrying the current to be measured or controlled.
<u>Decelerating Relay</u>	A relay that functions automatically to maintain the armature current or voltage within limits, when decelerating from speeds above base speed, by controlling the excitation of the motor field. See also: relay.
<u>De-Energize Relay</u>	To disconnect the relay from its power source.
<u>Definite Minimum-Time Relay</u>	An inverse-time relay in which the operating time becomes substantially constant at high values of input.
<u>Definite Minimum-Time Relay</u>	An inverse-time relay in which the operating time becomes substantially constant at high values of input.
<u>Definite Time (Relays)</u>	A qualifying term indicating that there is purposely introduced a delay in action, which delay remains substantially constant regardless of the magnitude of the quantity that causes the action. See also: relay.
<u>Delay Relay</u>	A relay having an assured time interval between energization and pickup or between de-energization and dropout. See also: relay.
<u>Demand-Totalization Relay</u>	A device designed to receive and totalize electric pulses from two or more sources for transmission to another relay.
<u>Direct-Current Relay</u>	See relay, direct current.
<u>Directional-Ground Relay</u>	A directional relay used primarily to detect single-phase-to-ground faults, but also sensitive to double-phase-to-ground faults.
<u>Directional-Overcurrent Relay</u>	A relay consisting of an overcurrent unit and a directional unit combined to operate jointly.

<u>Directional-Power Relay</u>	A relay that operates in conformance with the direction of power flow.
<u>Directional-Power Tripping</u>	See directional-power relay.
<u>Directional Relay</u>	A relay that responds to the relative phase position of a current with respect to another current or voltage reference.
<u>Distance Relay</u>	A generic term covering those forms of protective relays in which the response to the input quantities is primarily a function of the electrical circuit distance between the relay location and the point of fault.
<u>Dropout (Relay)</u>	A term for contact operation as a relay just departs from pickup. Also identifies the maximum value of an input quantity which will allow the relay to drop out. See also: relay.
<u>Dropout Ratio (Relay)</u>	The ratio of dropout to pickup of an input quantity. NOTE: This term has been used mostly with relays for which reset is not differentiated from dropout.
<u>Dropout Time (Relay)</u>	The time interval to dropout following a specified change in input conditions.
<u>Dry Feed Relay</u>	A reed relay with dry (non-mercury wetted) contacts.
<u>Electrically Reset Relay</u>	A relay that is so constructed that it remains in the picked up condition even after the input quantity is removed.
<u>Electric Bias, Relay</u>	See relay electric bias.
<u>Electric Reset Relay</u>	A relay that is so constructed that it remains in the picked up condition even after the input quantity is removed; an independent electric input is required to reset the relay.
<u>Electromagnetic Relay</u>	An electromechanical relay that operates principally by action of an electromagnetic element which is energized by the input quantity.
<u>Electromechanical Relay</u>	A relay that operates by physical movement of parts resulting from electromagnetic, electrostatic, or electrothermic force created by the input quantities.

<u>Enclosed Relay</u>	A relay that has both coil and contacts protected from the surrounding medium. See also: relay.
<u>End-On Armature Relay</u>	See also relay.
<u>False Tripping (Relay)</u>	In performance the tripping that should not have occurred considering the objectives of the relay system design. See also: relay.
<u>Fast-Operate, Fast Release Relay</u>	A high-speed relay specifically designed for both short operate and short-release time.
<u>Fast-Operate Relay</u>	A high-speed relay specifically designed for short operate time but not necessarily short release time.
<u>Fast-Operate, Slow Release Time Relay</u>	A relay Specifically designed for short operate time and long release time.
<u>Fault-Detector Relay</u>	A monitoring relay whose function is to limit the operation of associated protective relays to specific system conditions.
<u>Ferreed Relay</u>	Coined name for a special form of dry reed switch having a return magnetic path of high remanence material that provides a bi-stable, or latching, transfer contact.
<u>Field Accelerating Relaying</u>	A relay that functions automatically to maintain the armature current within limits, when accelerating to speeds above base speed, by controlling the excitation of the motor field.
<u>Field Application Relay</u>	A relay that functions automatically to maintain the armature current or voltage within limits, when decelerating from speeds above base speed, by controlling the excitation of the motor field. See also: relay.
<u>Field-Failure Relay</u>	A relay that functions to disconnect the motor armature from the line in the event of loss of field excitation. See also: relay.
<u>Field Forcing Relay</u>	A relay that functions to increase the rate of change of field flux by under-exciting or over-exciting the field of a rotating machine. See also: relay.

<u>Field Loss Relay</u>	See motor-field failure relay.
<u>Field Protective Relay</u>	A relay that functions to prevent over-heating of the field excitation winding by reducing or interrupting the excitation of the shunt field. See also: relay.
<u>Flasher Relay</u>	A relay that is so designed that, when energized, its contact open and close at predetermined intervals.
<u>Flow Relay</u>	A relay that responds to a rate of fluid flow.
<u>Frequency Relay</u>	A relay that responds to the frequency of an alternating electrical input quantity.
<u>Frequency Sensitive Relay</u>	A relay that operates when energized with voltage, current, or power within specific frequency bands.
<u>Fritting, Relay</u>	See relay fritting.
<u>Full Field Relay</u>	A relay that functions to maintain full field excitation of a motor while accelerating on reduced armature voltage. See also: relay.
<u>Function Relay</u>	A relay used a computing element, generally driven by a comparator.
<u>Gas Accumulator Relay</u>	A relay so constructed that it accumulated all or a fixed proportion of gas released by the protected equipment and operates by measuring the volume of gas so accumulated.
<u>Gasket-Sealed Relay</u>	A relay in an enclosure sealed with a gasket. See also: relay.
<u>Gas-Pressure Relay</u>	A relay so constructed that it operates by the gas pressure in the protected equipment.
<u>General Purpose Relay</u>	A relay that is adaptable to a variety of applications. See also: relay.
<u>Generator Field Decelerating Relay</u>	A relay that functions automatically to maintain the armature current within prescribed limits when a motor, supplied by a generator, is decelerated from base speed, or less, by controlling the generator field current. See also: relay.

<u>Ground Relay</u>	A relay that, by its design or application, is intended to respond primarily to system ground faults.
<u>Hand-Reset Relay</u>	A relay that is so constructed that it remains in the picked up condition even after the quantity is removed; specific manual action is required to reset the relay.
<u>Harmonic-Restraint Relay</u>	A relay so constructed that its operation is restrained by selecting harmonic components of one or more separate input quantities. See also: relay.
<u>High-Speed Relay</u>	A relay that operates in less than a specified time.
<u>High-Voltage Relay</u>	<ol style="list-style-type: none"> 1. A relay adjusted to sense and function in a circuit or system at a specific maximum voltage. 2. A relay designed to handle elevated voltages on its contacts, coil or both.
<u>Homing Relay</u>	A stepping relay that returns to a specified starting position prior to each operating cycle. See also: relay
<u>Hot-Wire Relay</u>	A relay in which the operating current flows directly through a tension member whose thermal expansion actuates the relay. See also: relay.
<u>Impedance Relay</u>	A distance relay in which the threshold value of operation depends only on the magnitude of the impedance and is substantially independent of the phase angle of the impedance.
<u>Impulse Relay</u>	A relay that operates on stored energy of a short pulse after the pulse ends. See also: relay.
<u>Impulse Transmitting Relay</u>	A relay that closes a set of contacts briefly while going from energized to the de-energized position or vice versa. See also: relay.
<u>Incorrect Relay Operation</u>	Any output response or lack of output response by the relay that, for the applied input quantities, is not correct.

<u>Induction Cup (Relay)</u>	A form of relay armature in the shape of a cylinder with a closed end that develops operating torque by its location within the fields of electromagnets that are excited by the input quantities.
<u>Induction Cylinder (Relay)</u>	A form of relay armature in the shape of an open-ended cylinder that develops operating torque by its location within the fields of electromagnets, that are excited by the input quantities.
<u>Induction Disc (Relay)</u>	A thin circular disk of nonmagnetic conducting material in which eddy currents are produced to create torque about an axis of rotation.
<u>Induction Loop (Relay)</u>	A form or relay armature consisting of a single turn or loop that develops operating torque by its location within the fields of electromagnets that are excited by the input quantities.
<u>Inertia Relay</u>	A relay with added weights or other modifications that increase its moment of inertia in order either to slow it or to cause it to continue in motion after the energizing force ends. See also: relay.
<u>Instantaneous Relay</u>	A qualifying term applied to a relay or other device indicating that no delay is purposely introduced in its action. See also: relay.
<u>Integrating Relay</u>	A relay that operates on the energy stored from a long pulse or a series of pulses of the same or varying magnitude, for example, a thermal relay. See also: relay.
<u>Inverse-Time Relay</u>	A relay in which the input quantity and operating time are inversely related throughout at least a substantial portion of the performance range.
<u>Just-Operate Value, Relay</u>	See relay just operate value.
<u>Latching Relay</u>	A relay that is constructed that it maintains a given position by means of a mechanical latch until released mechanically or electrically. See also: latch-in relay, relay.
<u>Latch-In Relay</u>	A relay that maintains its contacts in the last position assumed without need of maintaining coil energization.

<u>Leakage Flux, Relay</u>	See relay leakage flux.
<u>Lens Distance Relay</u>	A distance relay that has an operating characteristic comprising the common area of two intersection MHO relay characteristics.
<u>Level Detector (Relay)</u>	A device that produces a change in output at a prescribed input level.
<u>Level Relay</u>	See relay level.
<u>Linear-Impedance Relay</u>	A distance relay for which the operating characteristic on a R-X diagram is a straight line.
<u>Lockout Relay</u>	An electrically reset or hand-reset auxiliary relay whose function is to hold associated devices inoperative until it is reset.
<u>Lock-Up Relay</u>	Sometimes used as a latching relay. See also: relay.
<u>Loss of Excitation Relay</u>	A relay that produces an output when the input to a synchronous machine indicates that the machine has substantially lost its field excitation.
<u>Magnetic Bias, Relay</u>	See relay magnetic bias.
<u>Magnetic Control Relay</u>	A relay that is actuated by electromagnetic means. See also: relay.
<u>Magnetic Latching Relay</u>	A relay that remains operated from remanent magnetism until reset electrically.
<u>Magnetic Overload Relay</u>	An overcurrent relay, the electric contacts of which are actuated by the electromagnetic force produced by the load current of a measure of it. See also: relay.
<u>Magnetostrictive Relay</u>	A relay in which operation depends upon dimensional changes of a magnetic material in a magnetic field. See also: relay.
<u>Manual-Reset Relay</u>	See relay, manual reset.
<u>Marginal Relay</u>	A relay that functions in response to predetermined changes in the value of the coil current or voltage. See also: relay.
<u>Mechanically Reset Relay</u>	See hand reset relay.

<u>Mechanically Timed Relays</u>	Relays that are timed mechanically by such features as clock work, escapement bellows, or dash pot. See also: relay.
<u>Memory Relay</u>	A relay having two or more coils, each of which may operate independent sets of contacts that remain in a position determined by the coil energized. See also: relay.
<u>Mercury-Contact Relay</u>	A relay in which the magnetic attraction of a floating plunger by a field surrounding a sealed capsule displaces mercury in a pool to effect contacting between fixed electrodes. See also: mercury relay.
<u>Mercury Relay</u>	A relay in which the movement of mercury opens and closes contacts. See also: mercury-contact relay.
<u>Meter Relay</u>	Sometimes used for instrument relay. See also: relay.
<u>Modified Impedance Relay</u>	An impedance form of distance relay for which the operating characteristic of the distance unit on an R-X diagram is a circle having its center displaced from the origin.
<u>Monitoring Relay</u>	A relay that has its function to verify that system or control-circuit conditions conform to prescribed limits.
<u>Motor-Driven Relay</u>	A relay in which contact actuation is controlled through an electric motor, cams, and systems of gears. See also: relay.
<u>Motor-Field Accelerating Relay</u>	A relay that functions automatically to maintain the armature current within limits, when accelerating to speeds above base speed, by controlling the excitation of the motor field. See also: relay.
<u>Motor-Field Relay</u>	A relay that functions to disconnect the motor armature from the line in the event of loss of field excitation. See also: relay.

<u>Motor-Field Protective Relay</u>	<p>A relay that function to prevent over-heating of the field excitation winding by reducing the excitation of the shunt field.</p> <p>See also: relay.</p>
<u>Multi-Position Relay</u>	<p>A relay that has more than one operate or non-operate position, for example, a stepping relay.</p> <p>See also: relay.</p>
<u>Multi-Restraint Relay</u>	<p>A restraint relay that is so constructed that its operation is restrained by ore than one input quantity.</p>
<u>Negative-Phase-Sequence Relay</u>	<p>A relay that responds to the negative-phase-sequence component of a poly-phase input quantity. See also: relay.</p>
<u>Network Master Relay</u>	<p>A relay that functions as a protective relay by opening a network protector when power is back-fed into the supply system as a programming relay by closing the protector in conjunction with the network phasing relay when poly-phase voltage phasors are within prescribed limits.</p>
<u>Network Phasing Relay</u>	<p>A monitoring relay that has as its function to limit the operation of a network master relay so that the network protector may close only when the voltage on the two sides of the protector are in a predetermined phasor relationship.</p>
<u>Neutral Relay</u>	<p>A relay that responds to quantities in the neutral of a power circuit.</p> <p>See also: electromagnetic relay, relay.</p>
<u>Notching (Relays)</u>	<p>A qualifying terms applied to a relay indicating that a predetermined number of separate impulses is required to complete operation.</p> <p>See also: relay.</p>
<u>Notching Relay</u>	<p>A programmed relay in which the respoinse is dependent upon successive impulses of the input quantity.</p>
<u>Open-Phase Relay</u>	<p>A poly-phase relay designed to operate when one or more input phases of a poly-phase circuit are open.</p> <p>See also: relay.</p>

<u>Operating Characteristic (Relay)</u>	The response of the relay to the input quantities that result in relay operation.
<u>Operating Time (Relay)</u>	The time interval from occurrence of specified input conditions to a specified operation.
<u>Operational Relay</u>	A relay that may be driven from one position or state to another by an operational amplifier or a relay amplifier. See also: function relay.
<u>Operation Indicator (Relay)</u>	See target, relay.
<u>Overcurrent Relay</u>	A relay that operates when its input current exceeds a predetermined value.
<u>Overload Relay</u>	A relay that responds to electric load and operates at a preset value of overload. Overload relays are usually current relays but they be power, temperature, or other relays.
<u>Overreach Relay</u>	The extension of the zone of protection beyond that indicated by the relay setting.
<u>Overreaching Protection</u>	A form of protection in which the relays at one terminal operate for faults beyond the next terminal.
<u>Over-Speed Protection (Relays)</u>	A form of protection that operates when the speed of rotation exceeds a predetermined value.
<u>Over-Travel Relay</u>	The amount of continued movement of the responsive element after the input is changed to a value below pickup.
<u>Over-Voltage Relay</u>	A relay that operates when its input voltage exceeds a predetermined value.
<u>Percentage Differential Relay</u>	A differential relay in which the designed response to the phasor difference between incoming and outgoing electrical quantities is modified by a restraining action of one or more of the input quantities.
<u>Phase-Balance Relay</u>	A relay that responds to difference between quantities of the same nature associated with different phases of a normally balanced poly-phase circuit.
<u>Phase-Comparison Protection</u>	A form of pilot protection that compares the relative phase angle position of specified currents at the terminals of a circuit.

<u>Phase Relay</u>	A relay that by its design or application is intended to respond primarily to phase conditions of the power system.
<u>Phase-Reversal Relay</u>	See negative-phase-sequence relay.
<u>Phase-Selector Relay</u>	A programming relay whose function is to select the faulted phase or phases thereby controlling the operation of other relays or control devices.
<u>Phase-Sequence Relay</u>	A relay that responds to the order in which the phase voltages or currents successively reach their maximum positive values. See also: relay.
<u>Phase-Undervoltage Relay</u>	A relay that operates when one or more phase voltages in a normally balanced poly-phase circuit is less than a predetermined value.
<u>Photoelectric Relay</u>	A relay that functions at predetermined values of incident light.
<u>Pickup (Relay)</u>	<ol style="list-style-type: none"> 1. The action of a relay as it makes designated response to increase of input. 2. As a qualifying term, the state of a relay when all response to increase of input has been completed. <p>See also: relay.</p>
<u>Pilot Protection (Relay Systems)</u>	A form of line protection that uses a communication channel as a means to compare electrical conditions at the terminals of a line.
<u>Pilot Wire Relaying</u>	Line protective relaying scheme employing a communication channel in conjunction with protective relays to quickly ascertain whether a fault is within the protected line or external to it. High speed determination of fault location permits high speed tripping of all terminals feeding the faulted line. See also: pilot protection.
<u>Plunger Relay</u>	A relay operated by a movable core or plunger through solenoid action. See also: relay.

<u>Polarized Relay</u>	A relay that consists of two elements, one of which operates as a neutral relay and the other of which operates as a polar relay. See also: neutral relay, polar relay.
<u>Polar Relay</u>	A relay in which the direction of movement of the armature depends upon the direction of the current in the circuit controlling the armature. See also: electromagnetic relay, neutral relay, polarized relay.
<u>Poly-Phase (Relay)</u>	A descriptive term indicating that the relay is responsive to poly-phase alternating electric input quantities.
<u>Positive-Phase-Sequence Relay</u>	A relay that responds to the positive-phase-sequence component of a poly-phase input quantity.
<u>Power Line Carrier</u> PLC	Involves signaling a remote location by coupling a high frequency signal directly to one or more of the primary power system conductors.
<u>Power Line Carrier Receiver</u> PLCR	A receiver for power line carrier signals. See also: power line carrier.
<u>Power Line Carrier Transmitter</u> PLCT	A device for producing radio-frequency power for the purpose of transmission on power lines. See also: power line carrier.
<u>Power Relay</u>	<ol style="list-style-type: none"> 1. A relay that responds to power flow in an electric circuit. 2. A relay that responds to suitable product of voltage and current in an electric circuit. See also: relay.
<u>Power Supply Circuit (Relay System)</u>	An input circuit to a relay system which supplies auxiliary power for the proper functioning of the relay system.
<u>Power Transfer Relay</u>	A relay so connected to the normal power supply that the failure of such power supply causes the load to be transferred to another power supply.
<u>Power Type Relay</u>	A term for relay designed to have heavy-duty contacts usually rated 15 amperes or higher. Sometime called a contactor.

<u>Preference Relaying</u>	An assembly of devices arranged to prevent the transmission of any signals other than protective relaying signals over a channel when protective relaying signals are being transmitted. See also: relay.
<u>Pressure Relay</u>	A relay that responds to liquid or gas pressure.
<u>Primary Protection (Relaying)</u>	First choice relay protection in contrast with backup relay protection.
<u>Product Relay</u>	A relay that operates in response to a suitable product of two alternating electrical input quantities. See also: relay.
<u>Programming Relay</u>	A relay whose function is to establish or detect electrical sequences.
<u>Protective Relay</u>	A relay whose function is to detect defective line or apparatus or other power system conditions of an abnormal or dangerous nature and to initiate appropriate control circuit action.
<u>Quotient Relay</u>	A relay that operates in response to a suitable quotient of two alternating electrical input quantities. See also: relay.
<u>Reach (Protective Relaying)</u>	The maximum distance from the relay location to a fault for which a particular relay will operate. The reach may be stated in terms of miles, primary ohms, or secondary ohms.
<u>Reactive-Power Relay</u>	A power relay that responds to reactive power. See also: relay.
<u>Reclosing Relay</u>	A programming relay whose function is to initiate the automatic reclosing of a circuit breaker.
<u>Reclosure (Relay)</u>	The automatic closing of a circuit-interrupting device following automatic tripping. Reclosing may be programmed for any combination of instantaneous, time delay, single-shot, multiple-shot, synchronism-check, dead-line-live bus, or dead-bus-live-line-operation.
<u>Relay (General)</u>	An electric device that is designed to interpret input conditions in a prescribed manner and after specified conditions are met to respond to cause contact operation or similar abrupt change in associated electric control circuits.

<u>Relay Armature</u>	The moving element that contributes to the designed response of the relay and that usually has associated with it a part of the relay contact assembly.
<u>Relay Actuation Time</u>	The time at which a specified contact functions.
<u>Relay Actuation Time (Effective)</u>	The sum of the initial actuation time and the contact chatter intervals following such actuation.
<u>Relay Actuation Time (Initial)</u>	The time of the first closing of a previously open contact of the first opening of a previously closed contact.
<u>Relay Actuator</u>	The part of the relay that converts electric energy into mechanical work.
<u>Relay Adjustment</u>	The modification of the shape or position of relay parts to affect one or more of the operating characteristics, that is armature gap, restoring spring, contact gap.
<u>Relay Air Gap</u>	Air space between the armature and the pole piece. This is used in some relays instead of a nonmagnetic separator to provide a break in the magnetic circuit.
<u>Relay, Alternating-Current</u>	A relay designed for operation from an alternating-current source. See also: relay.
<u>Relay Amplifier</u>	An amplifier that drives an electromechanical relay.
<u>Relay Antifreeze Pin</u>	Sometimes used for relay armature stop, nonmagnetic.
<u>Relay Armature, Balanced</u>	An armature that is approximately in equilibrium with respect to both static and dynamic forces.
<u>Relay Armature Bounce</u>	See relay armature rebound.
<u>Relay Armature Card</u>	An insulating member used to link the movable springs to the armature.
<u>Relay Armature contact</u>	1. A contact mounted directly on the armature. 2. Sometimes used for relay contact movable.
<u>Relay Armature, End-On</u>	An armature whose motion is in the direction of the core axis, with the pole face at the end of the core and perpendicular to this axis.

<u>Relay Armature, Flat-Type</u>	An armature that rotates about an axis perpendicular to that of the core, with the pole face on a side surface of the core.
<u>Relay Armature Gap</u>	The distance between armature and pole face.
<u>Relay Armature Hesitation</u>	Delay or momentary reversal of armature motion in either the operate or release stroke.
<u>Relay Armature Lifter</u>	See relay armature stud.
<u>Relay Armature, Long-Lever</u>	An armature with an armature ratio greater than 1:1.
<u>Relay Armature Over-Travel</u>	The portion of the available stroke occurring after contacts have touched.
<u>Relay Armature Ratio</u>	The ratio of the distance through which the armature stud or card moves to the armature bounce.
<u>Relay Armature Rebound</u>	Return motion of the armature following impact on the backstop. See also: relay armature bounce.
<u>Relay Armature, Short-Lever</u>	An armature with an armature ratio of 1:1 or less.
<u>Relay Armature, Side</u>	An armature that rotates about an axis parallel to that of the core, with the pole face on a side surface of the core.
<u>Relay Armature Stop, Nonmagnetic</u>	A nonmagnetic member separating the pole faces of core and armature in the operated position, used to reduce and stabilize the pull from residual magnetism in release.
<u>Relay Armature Stud</u>	An insulating member that transmits the motion of the armature to an adjacent contact member.
<u>Relay Armature Travel</u>	The distance traveled during operation by a specified point on the armature.
<u>Relay, Automatic Reset</u>	<ol style="list-style-type: none"> 1. A stepping relay that returns to its home position either when it reaches a predetermined contact position, or when a pulsing circuit fails to energize the driving coil within a given time. May either pulse forward or be spring reset to the home position. 2. An overload relay that restores the circuit as soon as an overcurrent situation is corrected.

<u>Relay Back Contacts</u>	Sometimes used for relay contacts, normally closed.
<u>Relay Backstop</u>	The part of the relay that limits the movement of the armature away from the pole face or core. In some relays a normally closed contact may serve as backstop.
<u>Relay Backup</u>	That part of the backup protection that operates in the event of failure of the primary relays.
<u>Relay Bank</u>	See relay level.
<u>Relay Bias Winding</u>	An auxiliary winding used to produce an electric bias.
<u>Relay Blades</u>	Sometimes used for relay contact springs.
<u>Relay Bracer Spring</u>	A supporting member used in conjunction with a contact spring.
<u>Relay Bridging</u>	<ol style="list-style-type: none"> 1. A result of contact erosion, wherein a metallic protrusion or bridge is built up between opposite contact faces to cause an electric path between them. 2. A form of contact erosion occurring on the break of a low-voltage, low-inductance circuit, at the instant of separation, that results in melting and resolidifying a contact metal in the form of a metallic protrusion or bridge. 3. Make-before-break contact action, as when a wiper touches two successive contacts simultaneously while moving from one to the other.
<u>Relay Brush</u>	See relay wiper.
<u>Relay Bunching Time</u>	The time during which all three contacts of a bridging contact combination are electrically connected during the armature stroke.
<u>Relay Bushing</u>	Sometimes used for relay spring stud.
<u>Relay Chatter Time</u>	The time interval from initial actuation of a contact to the end of chatter.
<u>Relay Coil</u>	One or more windings on a common form.
<u>Relay Coil, Concentric-Wound</u>	A coil with two or more insulated windings, wound one over the other.

<u>Relay-Coil Dissipation</u>	The amount of electric power consumed by a winding for the most practical purposes. This equals the I^2R loss.
<u>Relay-Coil Resistance</u>	The total terminal-to-terminal resistance of a coil at a specified temperature.
<u>Relay-Coil Serving</u>	A covering, such as thread or tape, that protects the winding from mechanical damage.
<u>Relay-Coil Temperature Rise</u>	The increase in temperature of a winding above the ambient temperature when energized under specific conditions for a given period of time, usually the time required to reach a stable temperature.
<u>Relay-Coil Terminal</u>	A device, such as a solder lug, binding post, or similar fitting, to which the coil power supply is connected.
<u>Relay-Coil Tube</u>	An insulated tube upon which a coil is wound.
<u>Relay Comb</u>	An insulating member used to position a group of contact springs.
<u>Relay Contact Actuation Time</u>	The time required for any specified contact on the relay to function according to the following subdivisions. When not otherwise specified, contact actuation time is relay initial actuation time. For some purposes, it is preferable to state the actuation time in term of final actuation time in terms of final actuation time or effective actuation time.
<u>Relay Contact Arrangement</u>	The combination of contact forms that make up the entire relay switching structures.
<u>Relay Contact Bounce</u>	Sometimes used for relay contact chatter, when internally caused.
<u>Relay Contact Chatter</u>	The undesired intermittent closure of open contacts or opening of closed contacts. It may occur either when relay is operated or released or when the relay is subjected to external shock or vibration.
<u>Relay Contact Chatter, Armature Impact</u>	Chatter ascribed to delay or momentary reversal in direction of the armature motion during either the operate or the release stroke.
<u>Relay Contact Chatter, Armature Rebound</u>	Chatter ascribed to the partial return of the armature to its operated position as a result of rebound from the backstop in release.

<u>Relay Contact Chatter, Externally Caused</u>	Chatter resulting from shock or vibration imposed on the relay by external action.
<u>Relay Contact Chatter, External Shock</u>	Chatter ascribed to impact experience by the relay or by the apparatus of which it forms a part.
<u>Relay Contact Chatter, Initial</u>	Chatter ascribed to vibration produced by opening or closing the contact themselves, as by contact impact in closure.
<u>Relay Contact Chatter, Internally Caused</u>	Chatter resulting from the operation or release of the relay.
<u>Relay Contact Chatter, Transmitted Vibration</u>	Chatter ascribed to vibration originating outside the relay and transmitted to it through its mounting.
<u>Relay Contact Combination</u>	<ol style="list-style-type: none"> 1. The total assembly of contacts on a relay. 2. Sometimes used for contact form.
<u>Relay Contact, Fixed</u>	See relay contact, stationary.
<u>Relay Contact Follow</u>	The displacement of a stated point on the contact-actuating member following initial closure of a contact.
<u>Relay Contact Follow, Stiffness</u>	The rate of change of contact force per unit contact follow.
<u>Relay Contact Form</u>	A single-pole contact assembly.
<u>Relay Contact Functioning</u>	The establishment of the specified electrical state of the contacts as a continuous condition.
<u>Relay Contact Gap</u>	See relay contact separation.
<u>Relay Contact, Movable</u>	The member of a contact pair that is moved directly by the actuating system.
<u>Relay Contact Pole</u>	Sometimes used for relay contact, movable.
<u>Relay Contact Rating</u>	A statement of the conditions under which a contact will perform satisfactorily.
<u>Relay Contacts</u>	The current-carrying parts of a relay that engage or disengage to open or close electric circuits.
<u>Relay Contact, Auxiliary</u>	Contacts of lower capacity than the main contacts; used to keep the coil energized when the original operating circuit is open, to operate a audible or visual signal indicating the position of the main contacts, or to establish interlocking circuits, etc.
<u>Relay Contact, Back</u>	Sometimes used for relay contacts, normally closed.

<u>Relay Contacts, Break</u>	See relay contacts, normally closed.
<u>Relay Contacts, Break-Make</u>	A contact form in which one contact opens its connection to another contact and then closes its connection to a third contact.
<u>Relay Contacts, Bridging</u>	A contact form in which the moving contact touches two stationary contacts simultaneously during transfer.
<u>Relay Contacts, Continuity Transfer</u>	Sometimes used for relay contacts, make-break.
<u>Relay Contacts, Double Break</u>	A contact form in which one contact is normally closed in simultaneous connection with two other contacts.
<u>Relay Contacts, Dry</u>	<ol style="list-style-type: none"> 1. Contacts which neither break or make current. 2. Erroneously used for relay contact, low level.
<u>Relay Contacts, Early</u>	Sometimes used for relay contacts, preliminary.
<u>Relay Contacts, Front</u>	Sometimes used for relay contacts, normally open.
<u>Relay Contacts, Interrupter</u>	An additional set of contacts on a stepping relay, operated directly by the armature.
<u>Relay Contacts, Late</u>	Contacts that open or close after other contacts when the relay is operated.
<u>Relay Contacts, Low-Capacitance</u>	A type of contact construction providing low intercontact capacitance.
<u>Relay Contacts, Low-Level</u>	Contacts that control only the flow of relatively small currents in relatively low-voltage circuits; for example, alternating currents and voltages encountered in voice or tone circuits, direct currents and voltage of the order of microamperes and microvolts, etc.
<u>Relay Contacts, Make</u>	See relay contacts, normally open.
<u>Relay Contacts, Make-Break</u>	A contact form in which one contact closes connection to another contact and then opens its prior connection to a third contact.
<u>Relay Contacts, Multiple-Break</u>	Contacts that open a circuit in two or more places.
<u>Relay Contacts, Nonbridging</u>	A contact arrangement in which the opening contact opens before the closing contact closes.
<u>Relay Contacts, Normally Closed</u>	A contact pair that is closed when the coil is not energized.

<u>Relay Contacts, Normally Open</u>	A contact pair that is open when the coil is not energized.
<u>Relay Contacts, Off-Normal</u>	Contacts on a multiple switch that are in one condition when the relay is in its normal position and in the reverse condition for any other position of the relay.
<u>Relay Contacts, Preliminary</u>	Contacts that open or close in advance of other contacts when the relay is operating.
<u>Relay Contacts, Sealed</u>	A contact assembly that is sealed in a compartment separate from the rest of the relay.
<u>Relay Contact Separation</u>	The distance between mating contacts when the contacts are open.
<u>Relay Contacts, Snap-Action</u>	A contact assembly having two or more equilibrium position, in one of which the contacts remain with substantially constant pressure during the initial motion of the actuating member, until a condition is reached at which stored energy snaps the contacts to a new position of equilibrium.
<u>Relay Contact Spring</u>	<ol style="list-style-type: none"> 1. A current-carrying spring to which the contacts are fastened. 2. A non-current-carrying spring that position and tensions a contact-carrying member.
<u>Relay Contact, Stationary</u>	The member of a contact pair that is not moved directly by the actuating system.
<u>Relay Contact Wipe</u>	The sliding or tangential motion between two contact surfaces when they are touching.
<u>Relay Core</u>	The magnetic member about which the coil is found.
<u>Relay Critical Voltage (Current)</u>	That voltage (current) that will just maintain thermal relay contacts operated.
<u>Relay Cycle Timer</u>	A controlling mechanism that opens or closes contacts according a preset cycle.
<u>Relay Damping Ring, Mechanical</u>	A loose member mounted on a contact spring to reduce contact chatter.
<u>Relay, Direct-Current</u>	A relay designed for operation from a direct-current source.
	See also: relay.

<u>Relay, Double-Pole</u>	A term applied to a contact arranged to denote that it includes two separate contact forms; that is, two single-pole contact assemblies.
<u>Relay, Double-Throw</u>	A term applied to a contact arrangement to denote that each contact form included is a break-make.
<u>Relay Drop-Out</u>	See relay release.
<u>Relay, Dry Circuit</u>	Erroneously used for a relay with either dry or low-level contact. See also: relay contact, low-level.
<u>Relay Duty Cycle</u>	A statement of energized and de-energized time in repetitious operation, as: 2 seconds off.
<u>Relay Electric Bias</u>	An electrically produced force tending to move the armature towards a given position.
<u>Relay, Electric Reset</u>	A relay that may be reset electrically after an operation.
<u>Relay, Electromagnetic</u>	A relay, controlled by electromagnetic means, that opens and closes electric contacts. See also: relay.
<u>Relay, Electrostatic</u>	A relay in which the actuator element consists of nonconducting media separating two or more conductors that change their relative positions because of the mutual attraction or repulsion by electric charges applied to the conductors. See also: relay.
<u>Relay, Electrostrictive</u>	A relay in which an electrostrictive dielectric serves as the actuator. See also: relay.
<u>Relay Electrothermal Expansion Element</u>	An actuating element in the form of a wire strip or other shape having a high coefficient of thermal expansion.
<u>Relay Element</u>	A subassembly of parts. NOTE: The combination of several relay elements constitutes a relay unit.
<u>Relay Finish Lead</u>	The outer termination of the coil.
<u>Relay, Flat-Type</u>	See relay armature, flat-type.
<u>Relay Frame</u>	The main supporting portion of a relay. This may include parts of the magnetic structure.
<u>Relay Freezing, Magnetic</u>	Sticking of the relay armature to the core as a result of residual magnetism.

<u>Relay Fritting</u>	Contact erosion in which the electrical discharge make a hole through the film and produces molten matter that is drawn into the hole by electrostatic forces and solidifies there to form a conducting bridge.
<u>Relay Front Contacts</u>	Sometimes used for relay contact, normally open.
<u>Relay Functioning Time</u>	The time between energization and operation or between de-energization and release.
<u>Relay Functioning Value</u>	The value of applied voltage, current, or power at which the relay operates or releases.
<u>Relay Header</u>	The subassembly that provides support and insulation to the leads passing through the walls of a sealed relay.
<u>Relay Heater</u>	A resistor that converts electric energy into heat for operating a thermal relay.
<u>Relay Heel Piece</u>	The portion of a magnetic circuit of a relay that is attached to the end of the core remote from the armature.
<u>Relay, High, Common, Low (HCL)</u>	A type of relay control used in such devices as thermostats and in relay operated by them, in which a momentary contact between the common lead and another lead operates the relay, that then remains operated until a momentary contact between the common lead and third lead causes the relay to return to its original position.
<u>Relay Hinge</u>	The joint that permits movement of the armature relative to the stationary parts of the relay structure.
<u>Relay Hold</u>	A specified functioning value at which no relay meeting the specification may release.
<u>Relay Housing</u>	An enclosure for one or more relays, with or without accessories, usually providing access to the terminals.
<u>Relay Hum</u>	The sound emitted by relays when their coil is energized by alternating current or in some cases by unfiltered rectified current.
<u>Relay Inside Lead</u>	See relay start lead.
<u>Relay Inverse Time</u>	A qualifying term applied to a relay indicating that its time of operation decreases as the magnitude of the operating quantity increases.

<u>Relay Just-Operate Value</u>	The measure functioning value at which a particular relay operates.
<u>Relay Just-Release Value</u>	The measured functioning value for the release of a particular relay.
<u>Relay Leakage Flux</u>	The portion o the magnetic flux that does not cross the armature-to-pole-face gap.
<u>Relay Level</u>	A series of contacts served by one wiper in a stepping relay.
<u>Relay Load Curves</u>	The static force displacement characteristic of the total load of the relay.
<u>Relay Magnetic Bias</u>	A steady magnetic field applied to the magnetic circuit of a relay.
<u>Relay Magnetic Gap</u>	Nonmagnetic portion of a magnetic circuit.
<u>Relay, Manual Reset</u>	A relay that may be reset manually after an operation.
<u>Relay Mechanical Bias</u>	A mechanical force tending to move the armature toward a given position.
<u>Relay Mounting Plane</u>	The plane to which the relay mounting surface is fastened.
<u>Relay Must-Operate Value</u>	A specified functioning value at which all relays meeting the specification must operate.
<u>Relay Must-Release Value</u>	A specified functioning value, at which all relays meeting the specifications must release.
<u>Relay Non-Freeze Pin</u>	Sometimes used for relay armature stop, nonmagnetic.
<u>Relay Non-Operate Value</u>	A specified functioning value at which no relay meeting the specification may operate.
<u>Relay Normal Condition</u>	The deenergized condition of the relay.
<u>Relay Operate</u>	The condition attained by a relay when all contacts have functioned. See also: relay contact actuation time.
<u>Relay Operate Time</u>	The time interval from coil energization to the functioning time of the last contact to function. Where not otherwise stated the functioning time of the contact in question is taken as its initial functioning time.
<u>Relay Operate Time Characteristic</u>	The relation between the operate time of an electromagnetic relay and operate power.

<u>Relay Operating Frequency</u>	The rated alternating-current frequency of the supply voltage at which the relay is designed to operate.
<u>Relay Outside Lead</u>	See relay finish lead.
<u>Relay Over-Travel</u>	Amount of contact wipe. See also: relay armature over-travel, relay contact wipe.
<u>Relay Pickup Value</u>	Sometimes used for relay must-operate value.
<u>Relay Pileup</u>	A set of contact arms, assemblies, or springs, fastened one on top of the other with insulation between them.
<u>Relay Pneumatic Bellows</u>	Gas-filled bellows, sometimes used with plunger-type relays to obtain time delay.
<u>Relay Pole Face</u>	The part of the magnetic structure at the end of the core nearest armature.
<u>Relay Pole Piece</u>	The end of an electromagnet, sometimes separable from the main section, and usually shaped so as to distribute the magnetic field in a pattern best suited to the application.
<u>Relay Pull Curves</u>	The force-displacement characteristics of the actuating system of the relay.
<u>Relay Pull-In Valve</u>	Sometimes used for relay must-operate value.
<u>Relay Pusher</u>	Sometimes used for relay armature stud. See also: relay.
<u>Relay Rating</u>	A statement of the conditions under which a relay will perform satisfactorily.
<u>Relay Recovery Time</u>	A cooling time required from heater de-energization of a thermal time-delay relay to subsequent re-energization that will result in a new operate time equal to 85 percent of that exhibited from a cold start.
<u>Relay Recovery Time, Instantaneous</u>	Recovery time of a thermal relay measured when the heater is de-energized at the instant of contact operation.
<u>Relay Recovery Time, Saturated</u>	Recovery time of a thermal relay measured after temperature saturation has been reached.
<u>Relay Release</u>	The condition attained by a relay when all contacts have functioned and the armature (where applicable) has reached a fully opened position.

<u>Relay Release Time</u>	The time interval from coil de-energization to the functioning time of the last contact to function. Where not otherwise stated the functioning time of the contact in question is taken as its initial functioning time.
<u>Relay Reoperate Time</u>	Release time of a thermal relay.
<u>Relay Reoperate Time, Instantaneous</u>	Reoperate time of a thermal relay measured when the heater is de-energized at the instant of contact operation.
<u>Relay Reoperate Time, Saturated</u>	Reoperate time of a thermal relay measured when the relay is de-energized after temperature saturation (equilibrium) had been reached.
<u>Relay Residual Gap</u>	Sometimes used for relay armature stop, nonmagnetic.
<u>Relay Restoring Spring</u>	A spring that moves the armature to the normal position and holds it there when the relay is de-energized.
<u>Relay Retractable Spring</u>	Sometimes used for relay restoring spring.
<u>Relay Return Spring</u>	Sometimes used for relay restoring spring.
<u>Relay Saturation</u>	The condition attained in a magnetic material when an increase in field intensity produces no further increase in flux density.
<u>Relay Sealing</u>	Sometimes used for relay seating.
<u>Relay Seating Time</u>	The magnetic positioning of an armature in its final desired location.
<u>Relay Shading Coil</u>	Sometimes used for Relay Shading Ring.
<u>Relay Shading Ring</u>	A shortened turn surrounding a portion of the pole of an alternating-current magnet, producing a delay of the change of the magnetic field in that part, thereby tending to prevent chatter and reduce hum.
<u>Relay Shields, Electrostatic Spring</u>	Grounded conducting members located between two relay springs to minimize electrostatic coupling.
<u>Relay Shim, Nonmagnetic</u>	Sometimes used for Relay Armature, nonmagnetic.
<u>Relay, Single-Pole</u>	A relay in which all contacts connect, in one position or another, to a common contact.

<u>Relay, Single-Throw</u>	A relay in which each contact form included is a single contact pair.
<u>Relay Sleeve</u>	A conducting tube placed around the full length of the core as a short-circuited winding to retard the establishment or decay of flux within the magnetic path.
<u>Relay Slow-Release Time Characteristic</u>	The relation between the release time of an electromagnetic relay and the conductance of the winding circuit or of the conductor (sleeve or slug) used to delay release. The conductance in this definition is the quantity N^2/R , where N is the number of turns and R is the resistance of the closed winding circuit. (For a sleeve or slug $N = 1$)
<u>Relay Slug</u>	A conducting tube placed around a portion of the core to retard the establishment or decay of flux within the magnetic path.
<u>Relay Soak</u>	The condition of an electromagnetic relay when its core is approximately saturated.
<u>Relay Soak Value</u>	The voltage, current, or power applied to the relay coil to insure a condition approximating magnetic saturation.
<u>Relay Spool</u>	A flanged form upon which a coil is wound.
<u>Relay Spring Buffer</u>	Sometimes used for Relay Spring Stud.
<u>Relay Spring Curve</u>	A plot of spring force on the armature versus armature travel.
<u>Relay Spring Stop</u>	A member that controls the position of a pretensioned spring.
<u>Relay Stack</u>	Sometimes used for Relay Pileup.
<u>Relay Stagger Time</u>	The time interval between the actuation of any two contact sets.
<u>Relay Starting Switch (Rotating Machinery)</u>	A relay, actuated by current, voltage, or the combined effect of current and voltage, used to perform a circuit-changing function in the primary winding of a single-phase induction motor within a predetermined range of speed as the rotor accelerates; and to perform the reverse circuit-changing operation when the motor is disconnected from the supply line. One of the circuit changes that is usually performed is to open or disconnect the auxiliary-winding circuit. See also: starting-switch assembly.

<u>Relay Start Lead</u>	The inner termination of the coil.
<u>Relay Static Characteristic</u>	The static force-displacement characteristic of the spring system of the actuating system..
<u>Relay Station (Mobile Communication)</u>	A radio station used for the reception and retransmission of the signals fro another radio station. See also: mobile communication system.
<u>Relay Station (Surge Withstand Capability)</u>	An assembly usually consisting of measuring units, relay logic, communications interface, and necessary power supplies. The communications link is not considered as a part of a relay system.
<u>Relay Thermal</u>	A relay that is actuated by the heating effect of an electric current. See also: relay.
<u>Relay, Three-Position</u>	Sometimes used for a center-stable polar relay. See also: relay.
<u>Relay Transfer Contacts</u>	Sometimes used for Relay contacts, Break-Make.
<u>Relay Transfer Time</u>	The time interval between opening the closed contact and closing the open contact of a break-make contact form.
<u>Relay Unit</u>	An assembly of relay elements that in itself can perform a relay function. NOTE: One ore more relay units constitutes a relay.
<u>Relay Winding</u>	Sometimes use for relay coil.
<u>Relay Wiper</u>	The moving contact on a rotary stepping switch or relay.
<u>Resistance Relay</u>	A linear-impedance form of distance relay for which the operating characteristic on a R-X diagram is a straight line of constant resistance.
<u>Restraint Relay (Power Switchgear)</u>	A relay so constructed that its operation in response to one input is restrained by a second input.
<u>Reverse-Current Relay (Power Switchgear)</u>	A relay that operates on a current flow in a direct-current circuit in a direction opposite to a predetermined reference direction.
<u>Rotary Relay</u>	A relay whose armature moves in rotation to close the gap between two or more pole faces. Sometimes used for stepping relay. See also: relay.

<u>Seal-In Relay</u>	An auxiliary relay that remains pickup through one of its own contacts when it bypasses the initiating circuit until de-energized by some other device.
<u>Sector Impedance Relay</u>	A form of distance relay that by application and design has its operating characteristic limited to a sector of its operating circle on the F-X diagram.
<u>Self-Reset Relay</u> <u>(Automatically Reset Relay)</u>	A relay that is so constructed that it returns to its reset position following an operation after the input quantity is removed.
<u>Sensitive Relay</u>	A relay that operates on comparatively low input power, commonly defined as 100 milliwatts or less. See also: relay.
<u>Sequential Relay</u>	A relay that controls two or more sets of contacts in a predetermined sequence. See also: relay.
<u>Series Relay</u>	See current relay, relay.
<u>Single Element Relay</u>	An alternating-current relay having a set of coils energized by a single circuit.
<u>Single-Pole Relay</u>	See relay, single-pole.
<u>Slave Relay</u>	See auxiliary relay, relay.
<u>Slip Relay</u>	A relay arranged to act when one or more pairs of driving wheels increase or decrease in rotational speed with respect to other driving wheels of the same motive power unit.
<u>Slow-Operate Relay</u>	A slugged relay that has been specifically designed for long operate time but not for long release time.
<u>Slug, Relay</u>	See relay slug.
<u>Soak, Relay</u>	See relay soak.
<u>Solenoid, Relay</u>	See plunger relay, relay.
<u>Solid-State Relay</u>	A static relay or relay unit constructed exclusively of solid state components.
<u>Spring (Relay)</u>	See relay spring
<u>Stagger Time, Relay</u>	See relay stagger time.
<u>Startup (Relay)</u>	The action of a relay as it just departs from complete reset.

<u>Static Relay</u>	A relay or relay unit in which there is no armature or other moving element, the designed response being developed by electronic, solid-state, magnetic, or other components without mechanical motion.
<u>Stepping Relay</u>	A multi-position relay in which moving wiper contacts mate with successive sets of fixed contacts in a series of steps, moving from one step to the next in successive operations of the relay. See also: relay.
<u>Stepping Relay, Spring Actuated</u>	A stepping relay that is cocked electrically and operated by spring action. See also: relay.
<u>Sudden-Pressure Relay (Power Switchgear)</u>	A stepping relay that operates by the rate or rise in pressure of a liquid or gas.
<u>Supervisory Relay</u>	A relay that, during a call, is generally controlled by the transmitter current supplied to a subscriber line order to receive, from the associated station, directing signals that control the action of operators or switching mechanisms with regard to the connection.
<u>Susceptance Relay</u>	A mho-type distance relay for which the center of the operating characteristic on the F-X diagram is on the X axis.
<u>Synchronism-Check Relay</u>	A verification relay whose function is to operate when two input voltages are within predetermined phasor limits.
<u>Synchronizing Relay</u>	A programming relay whose function is to initiate the closing of a circuit breaker between two alternating-current sources when the voltage of these two sources have a predetermined relationship or magnitude, phase angle, and frequency.
<u>Tachometric Relay (Industrial Control)</u>	A relay in which actuation of the contacts is effected at a predetermined speed of a moving part. See also: relay.
<u>Target, Relay</u>	A supplementary device, operated either mechanically or electrically, to visibly indicate that the relay has operated or completed its function.

<u>Telephone-Type Relay</u>	An electromechanical relay with a hinged armature and stacked leaf-spring contacts.
<u>Temperature-Compensate Overload Relay</u>	A device that functions at any current in excess of a predetermined value essentially independent of the ambient temperature. See also: relay.
<u>Temperature Relays (Power Switchgear)</u>	A relay whose operation is caused by heat developed within the relay as a result of specified external conditions.
<u>Three-Position Relay</u>	A relay that may be operated to three distinct positions.
<u>Time-Delay Relay</u>	See delay relay, relay.
<u>Time Dial (Relay) (Time Lever)</u>	An adjustable, graduated element by which, under fixed input conditions, the prescribed relay operating time can be varied.
<u>Time-Overcurrent Relay</u>	An overcurrent relay in which the input current and operating time are inversely related throughout a substantial portion of the performance range.
<u>Timing Relay (Or Relay Unit)</u>	An auxiliary relay or relay unit whose function is to introduce one or more definite time delays in the completion of an association function. See also: relay.
<u>Torque Control (Relay)</u>	A method of constraining the pickup of a relay by preventing the torque-producing element from developing operating torque until another associated relay unit operates.
<u>Totalizing Relay</u>	A device used to receive and totalize pulses from two or more sources for proportional transmission to another totalizing relay or to a receiver.
<u>Transfer Trip</u>	A form of remote release in which a communication channel is used to transmit the signal for release from the relay location to a remote location.
<u>Transformer Relay</u>	A relay in which the coils act as a transformer.
<u>Transient Response (Relaying)</u>	The manner in which a relay, relay unit or relay system responds to a sudden change in the input(s).

<u>Two-Element Relay</u>	An alternating-current relay that is controlled by current from two circuits through two cooperating sets of coils.
<u>Under Current Relay (General)</u>	A relay that operates when the current through the relay is equal to or less than its setting. See also: relay.
<u>Under Current Relay (Power Switchgear)</u>	A relay that operates when the current is less than a predetermined value.
<u>Undervoltage Relay (Power Switchgear)</u>	A relay that operates when its voltage is less than a predetermined value.
<u>Unit, Relay</u>	See relay unit.
<u>Vane-Type Relay</u>	A type of alternating-current relay in which a light metal disc or vane moves in response to a change of the current in the controlling circuit or circuits.
<u>Verification Relay</u>	A monitoring relay restricted to functions pertaining to power-system conditions and not involving opening circuit breakers during fault conditions. Such a relay is sometimes referred to as a check or checking relay.
<u>Vibrating Reed Relay</u>	A relay in which the application of an alternating or a self-interrupted voltage to the driving coil produces an alternating or pulsating magnetic field that causes a reed to vibrate and operate contacts. See also: relay.
<u>Vibration Relay</u>	A relay that responds to the magnitude and frequency of a mechanical vibration.
<u>Voltage Rating (Relay)</u>	The voltage rating of a relay is the voltage at a specified frequency that may be sustained by the relay for an unlimited period without causing any of the prescribed limitations to be exceeded.
<u>Voltage-Regulating Relay</u>	A voltage sensitive device that is used on an automatically operated voltage regulator to control the voltage of the regulated circuit.
<u>Voltage Relay (Power Switchgear)</u>	A relay that responds to voltage. May be over or undervoltage relay or combination of both.

Voltage Sensing Relay

A term correctly used to designate a special-purpose voltage-rated relay that is adjusted by means of a voltmeter across its terminals in order to secure pickup at a specified critical voltage without regard to coil or heater resistance and resulting energizing current at that voltage.

Volts Per Hertz Relay

A relay whose pickup is a function of the ratio of voltage to frequency.

Wiper Relay

See relay wiper.

Wire Spring Relay

A relay design in which the contact are attached to round wire springs instead of the conventional flat or leaf spring.

Zero-Phase-Sequence Relay

A relay that responds to the zero-phase-sequence component of an input quantity.

Zone of Protection (Relays)

That segment of the power system in which the occurrence of assigned abnormal conditions should cause the protective relay system to operate.

See also: relay.

UMW ADPA - DTE

<u>Device Number</u>	<u>Definition and Function</u>
1	MASTER ELEMENT is the initiating device, such as a control switch, voltage relay, float switch, etc., which serve either directly, or through such permissive devices as protective and time-delay relays to place on equipment in or out of operation.
2	TIME-DELAY STARTING, OR CLOSING, RELAY is a device which functions to give a desired amount of time delay before or after any point of operation in a switching sequence or protective relay system, except as specifically provided by device functions 62 and 79 described later.
3	CHECKING OR INTERLOCKING RELAY is a device which operates in response to the position of a number of other devices, or to a number of predetermined conditions in equipment to allow an operating sequence to proceed, to stop, or to provide a check of the position of these devices or of these conditions for any purpose.
4	MASTER CONTACTOR is a device, generally controlled by device No. 1 or equivalent, and the necessary permissive and protective devices, which serves to make and break the necessary control circuits to place an equipment into operation under the desired conditions and to take it out of operation under other or abnormal conditions.
5	STOOPING DEVICE functions to place and hold equipment out of operation.
6	STARTING CIRCUIT BREAKER is a device show principle function is to connect a machine to its source of starting voltage.
7	ANODE CIRCUIT BREAKER is one used in the anode circuits of a power rectifier for the primary purpose of interrupting the rectifier circuit if an arc back should occur.

<u>Device Number</u>	<u>Definition and Function</u>
8	<p>CONTROL POWER DISCONNECTING DEVICE is a disconnecting device-such as a knife switch, circuit breaker or pullout fuse block-used for the purpose of connecting and disconnecting, respectively, the source of control power to and from the control bus or equipment.</p> <p>NOTE: Control power is considered to include auxiliary power which supplies such apparatus as small motors and heaters.</p>
9	<p>REVERSING DEVICE is used for the purpose of reversing a machine field or for performing any other reversing functions.</p>
10	<p>UNIT SEQUENCE SWITCH is used to change the sequence in which units may be placed in and out of service in multiple-unit equipments.</p>
11	Reserved for future application.
12	<p>OVER-SPEED DEVICE is usually a direct-connected speed switch which functions on machine overspeed.</p>
13	<p>SYNDHROUNOUS-SPEED DEVICE, such as a centrifugal-speed switch, a slip-frequency relay, a voltage relay, an undercurrent relay or any type of device, operates at approximately synchronous speed of a machine.</p>
14	<p>UNDER-SPEED DEVICE functions when the speed of a machine falls below a predetermined value.</p>
15	<p>SPEED OR FREQUENCY, MATCHING DEVICE functions to match and hold the speed or the frequency of a machine or of a system equal to, or approximately equal to, that of another machine, source or system.</p>
16	Reserved for future application.
17	<p>SHUNTING, OR DISCHARGE, SWITCH serves to open or to close a shunting circuit around any piece of apparatus (except a resistor), such as a machine field, a machine armature, a capacitor or a reactor.</p> <p>NOTE: This excludes devices which perform such shunting operations as may be necessary in the process of starting a machine by devices 6 or 42, or their equivalent, and also excludes device 73 function which serves for the switching of resistors.</p>

<u>Device Number</u>	<u>Definition and Function</u>
18	ACCELERATING OR DECELERATING DEVICE is used to close or to cause the closing of circuits which are used to increase or to decrease the speed of a machine.
19	STARTING-TO-RUNNING TRANSITION CONTACTOR is a device which operates to initiate or cause the automatic transfer of a machine from the starting to the running power connection.
20	ELECTRICALLY OPERATED VALVE is a solenoid or motor operated valve which is used in a vacuum, air, gas, oil, water, or similar lines. NOTE: The function of the valve may be indicated by the insertion of descriptive words such as "Break" or "Pressure Reducing" in the function name, such as "Electrically Operated Brake Valve."
21	DISTANCE RELAY is a device which functions when the circuit admittance, impedance or reactance increases or decreases beyond predetermined limits.
22	EQUALIZER CIRCUIT BREAKER is a breaker which serves to control or to make and break the equalizer or the current-balancing connections for a machine field, or for regulating equipment, in a multiple-unit installation.
23	TEMPERATURE CONTROL DEVICE functions to raise or to lower the temperature of a machine or other apparatus, or of any medium, when its temperature falls below or rises above a predetermined value. NOTE: An example is a thermostat which switches on a space heater in a switchgear assembly when the temperature falls to a desired value as distinguished from a device which is used to provide automatic temperature regulation between close limits and would be designed as 90T.
24	Reserved for future application.
25	SYNCHRONIZING, OR SYNCHRO-CHECK, DEVICE operates when two A-C circuits are within the desired limits of frequency phase angle or voltage, to permit or to cause the paralleling of these two circuits.

<u>Device Number</u>	<u>Definition and Function</u>
26	APPARATUS THERMAL DEVICE functions when the temperature of the shunt field or the armortisseur winding of a machine or that of load limiting or load shifting resistor or of a liquid or other medium exceeds a predetermined value; or if the temperature of the protected apparatus, such as a power rectifier, or of any medium decreases below a predetermined value.
27	UNDERVOLTAGE RELAY is a device which functions on a given value of undervoltage.
28	Reserved for future application.
29	ISOLATING CONTACTOR is used expressly for disconnecting one circuit from another for the purposes of emergency operation maintenance, or test.
30	ANNUNCIATOR RELAY is a nonautomatically reset device which gives a number of separate visual indications upon the functioning of protective devices, and which may also be arranged to perform a lockout function.
31	SEPARATE EXCITATION DEVICE connects a circuit such as the shunt field of a synchronous converter to a source of separate excitation during the starting sequence; or one which energizes the excitation and ignition circuits of a power rectifier.
32	DIRECTIONAL POWER RELAY is one which functions on a desired value of power flow in a given direction or upon reverse power resulting from arc back in the anode of cathode circuits of a power rectifier.
33	POSITION SWITCH makes or breaks contact when the main device or piece of apparatus, which has no device function number, reaches a given position.
34	MOTOR-OPERATED SEQUENCE SWITCH is a multi-contact switch which fixes the operating sequence of the major device during starting and stopping or during other sequential switching operations.
35	BRUSH-OPERATING, OR SLIP-RING SHORT-CIRCUITING, DEVICE is used for raising, lowering, or shifting the brushes of a machine or for short circuiting its slip rings, or for engaging or disengaging the contacts of a mechanical rectifier.

<u>Device Number</u>	<u>Definition and Function</u>
36	POLARITY DEVICE operates or permits the operation of another device on a predetermined polarity only.
37	UNDERCURRENT OR UNDERPOWER RELAY is a device which functions when the current or power flow decreases below a predetermined value.
38	BEARING PROTECTIVE DEVICE is one which functions on excessive bearing temperature, or on other abnormal mechanical conditions, such as undue wear, which may eventually result in excessive bearing temperature.
39	Reserve for future application.
40	FIELD RELAY is a device that functions on a given or abnormally low value or failure of machine field current, or on an excessive value of the reactive component of armature current in a-c machine indicating abnormally low field excitation.
41	FIED CIRCUIT BREAKER is a device which functions to apply, or to remove, the field excitation of a machine.
42	RUNNING CIRCUIT BREAKER is a device whose principle function is to connect a machine to its source of running voltage after having been brought up to the desired speed on the starting connection.
43	MANUAL TRANSFER OR SELECTOR DEVICE transfers the control circuits so as to modify the plan of operation of the switching equipment or of some of the devices.
44	UNIT SEQUENCE STARTING RELAY is a device which functions to start the next available unit in a multiple-unit equipment on the failure or on the non-availability of the normally preceding unit.
45	Reserved for future application.
46	REVERSE-PHASE, OR PHASE-BALANCE, CURRENT RELAY is a device which functions when the poly-phase currents are of reverse phase sequence, or when the poly-phase currents are unbalanced or contain negative phase-sequence components above a given amount.

<u>Device Number</u>	<u>Definition and Function</u>
47	PHASE-SEQUENCE VOLTAGE RELAY is a device which functions upon a predetermined value of poly-phase voltage in the desired phase sequence.
48	INCOMPLETE SEQUENCE RELAY is a device which returns the equipment to the normal or off position and locks it out if the normal starting, operating or stopping sequence is not properly completed within a predetermined time.
49	MACHINE, OR TRANSFORMER, THERMAL RELAY is a device which functions when the temperature of an a-c machine armature, or of the armature or other load carrying winding or element of a d-c machine, or converter or power rectifier or power transformer (including a power rectifier transformer) exceeds a predetermined value.
50	INSTANTANEOUS OVERCURRENT, OR RATE-OF-RISE RELAY is a device which functions instantaneously on an excessive value of current, or on a excessive rate of current rise, thus indicating a fault in the apparatus or circuit being protected.
51	A-C TIME OVERCURRENT RELAY is a device with either a definite or inverse time characteristic which functions when the current in an a-c circuit exceeds a predetermined value.
52	A-C CIRCUIT BREAKER is a device which is used to close and interrupt an a-c power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.
53	EXCITIER OR D-C GENERATOR RELAY is a device which forces the D-C machine field excitation to build up during starting or which functions when the machine voltage has built up to a given value.
54	HIGH-SPEED D-C- CIRCUIT BREAKER is a circuit breaker which starts to reduce the current in the main circuit in 0.01 seconds or less, after the occurrence of the D-C overcurrent of the excessive rate of current rise.
55	POWER FACTOR RELAY is a device which operates when the power factor in an A-C circuit becomes above or below a predetermined value.

<u>Device Number</u>	<u>Definition and Function</u>
56	FIELD APPLICATION RELAY is a device which automatically controls the application of the field excitation to an a-c motor at some predetermined point in the slip cycle.
57	SHORT-CIRCUITING OR GROUNDING DEVICE is a power or stored energy operated device which functions to short-circuit or to ground a circuit in response to automatic or manual means.
58	POWER RECTIFIER MISFIRE RELAY is a device which functions if one or more of the power rectifier anodes fails to fire.
59	OVERVOLTAGE RELAY is a device which functions on a given value of overvoltage.
60	VOLTAGE OR CURRENT BALANCE RELAY is a relay that operates on a given difference in voltage, or current input or output of two circuits.
61	Reserved for future application.
62	TIME-DELAY STOPPING OR OPENING RELAY is a time-delay relay that serves in conjunction with the device that initiates the shutdown, stopping, or opening operation in an automatic sequence.
63	PRESSURE SWITCH is a switch which operates on given values or on a given rate of change of pressure.
64	GROUND PROTECTIVE RELAY is a relay that functions on failure of the insulation of a machine, transformer or of other apparatus to ground, or on flashover of a d-c machine to ground. NOTE: This function is assigned only to a relay which detects the flow of current from the frame of a machine or enclosing case or structure of a piece of apparatus to ground, or detects a ground on a normally ungrounded winding or circuit. It is not applied to a device connected in the secondary circuit or secondary neutral of a current transformer, connected in the power circuit of a normally grounded system.
65	GOVERNOR is the assembly of fluid, electrical, or mechanical control equipment used for regulating the flow of water, steam or other medium to the prime mover for such purposes as starting, holding speed or load, or stopping.

<u>Device Number</u>	<u>Definition and Function</u>
66	NOTCHING OR JOGGING DEVICE functions to allow only a specified number of operations of a given device, or equipment, or a specified number of successive operations within a given time of each other. It also functions to energize a circuit periodically or for fractions of specified time intervals or that is used to permit intermittent acceleration or jogging of a machine at low speeds for mechanical positioning.
67	AC DIRECTIONAL OVERCURRENT RELAY is a relay that functions on a desired value of ac overcurrent flowing in a predetermined direction.
68	BLOCKING RELAY is a relay that initiates a pilot signal for blocking of tripping on external faults in a transmission line or in other apparatus under predetermined conditions, or cooperates with other devices to block tripping or to block reclosing on an out-of-step condition or on power swings.
69	PREMISSIVE CONTROL DEVICE is generally a two-position manually operated switch that in one position permits the closing of a circuit breaker, or the placing of an equipment into operation, and in the other position prevents the circuit breaker or the equipment from being operated.
70	RHEOSTAT is a variable resistance device used in an electric circuit, which is electrically operated or has other electrical accessories, such as auxiliary, position, or limit switches.
71	LEVEL SWITCH IS A SWITCH which operates on given values, or on a given rate of change, of level.
72	DC CIRCUIT BREAKER is used to close and interrupt a dc power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.
73	LOAD-RESISTOR CONTACTOR is used to shunt or insert a step of load limiting, shifting, or indicating resistance in power circuit, or to switch a space heater in circuit, or to switch a light, or regenerative load resistor of a power rectifier or other machine in and out of circuit.

<u>Device Number</u>	<u>Definition and Function</u>
74	ALARM RELAY is a device other than an annunciator, as covered under device No. 30, which is used to operate, or to operate in connection with, a visual or audible alarm.
75	POSITION CHANGING MECHANISM is a mechanism that is used for moving a main device from one position to another in an equipment; as for example, shifting a removable circuit breaker unit to and from the connected, disconnected, and test positions.
76	DC OVERCURRENT RELAY is a relay that functions when the current in a D-C circuit exceeds a give value.
77	PULSE TRANSMITTER is used to generate and transmit pulses over a telemetering or pilot-wire circuit to the remote indicating or receiving device.
78	PHASE ANGLE MEASUREING, OR OUT-OF-STEP PROTECTIVE RELAY is a relay that functions at a predetermined phase angle between two voltages or between two currents or between voltage and current.
79	AC RECLOSING RELAY is a relay that control the automatic reclosing and locking out of an A-C circuit interrupter.
80	FLOW SWITCH is a switch which functions on given values, or on a given rate of change, of flow.
81	FREQUENCY RELAY is a relay that functions on a predetermined value of frequency-either under or over on normal system frequency-or rate of change frequency.
82	DC RECLOSING RELAY is a relay that controls the automatic closing and reclosing of a D-C circuit interrupter, generally in response to load circuit conditions.
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY is a relay that operates to select automatically between certain sources or conditions in an equipment, or performs a transfer operation automatically.
84	OPERATING MECHANISM is the complete electrical mechanism or servo-mechanism, including the operating motor, solenoids, position switches, etc., for a tap changer, induction regulator or any similar piece of apparatus which has no device function number.

<u>Device Number</u>	<u>Definition and Function</u>
85	CARRIER PILOT-WIRE RECEIVER RELAY is a relay that is operated or restrained by a signal used in connection with carrier-current or dc pilot-wire fault directional relaying.
86	LOCKING-OUT RELAY is an electrically operated, hand or electrically reset, relay that functions to shutdown and hold equipment out of service on the occurrence of abnormal conditions.
87	DIFFERENTIAL PROTECTIVE RELAY is a protective relay that functions on a percentage or phase angle or other quantitative difference of two currents or of some other electrical quantity.
88	AUXILIARY MOTOR OR MOTOR GENERATOR is one used for operating auxiliary equipment such as pumps, blowers, exciters, rotating magnetic amplifiers, etc.
89	LINE SWITCH is used as a disconnecting load-interrupter, or isolating switch in an ac or dc power circuit, when this device is electrically operated or has electrical accessories such as an auxiliary switch, magnetic lock, etc.
90	REGULATING DEVICE functions to regulate a quantity, or quantities such as voltage, current, power, speed, frequency, temperature, and load, at a certain value or between certain (generally close) limits for machines, tie lines or other apparatus.
91	VOLTAGE DIRECTIONAL RELAY is a relay that operates when the voltage across an open circuit breaker or contactor exceeds a given value in a given direction.
92	VOLTAGE AND POWER DIRECTIONAL RELAY is a relay that permits or causes the connection of two circuits when the voltage difference between them exceeds a given value in a predetermined direction and causes these two circuits to be disconnected from each other when the power flowing between them exceeds a given value in the opposite direction.
93	FIELD CHANGING CONTACTOR functions to increase or decrease in one step the value of field excitation on a machine.

<u>Device Number</u>	<u>Definition and Function</u>
94	TRIPPING OR TRIP-FREE RELAY functions to trip a circuit breaker, contactor, or equipment, or to permit immediate tripping by other devices; or to prevent immediate reclosure of a circuit interrupter, in case it should open automatically even though its closing circuit is maintained closed.
95	Used only specific applications on individual
96	installations where none of the assigned numbered
97	functions from 1 to 94 is suitable.

UMW ADPA - DTEC

HIGH VOLTAGE DIRECT CURRENT

UMW ADPA - DIESEL

HVDC TRANSMISSION – INTRODUCTION

The traditional areas of HVDC application have included long distance overhead lines, underground and underwater cable configurations and cases where non-synchronous behavior of the DC link has been of particular benefit.

HVDC has proved economical when transmitting large amounts of power over long distances across land. Savings possible with overhead DC lines offset the higher costs of DC terminals at some circuit distance which generally exceed 400 miles.

The controllable property which permits rapid aid to transient stability and the means for dispatching any desired level of power in a steady-state condition is a performance benefit.

The DC power systems within MAPP deliver base load, bulk power from lignite-fueled minemouth generating stations to specified load centers. Additional capacity is provided for excess energy and emergency power transmission. Reverse power transmission can be initiated manually with an intermediate stop and subsequent manual restart.

UMW ADPA MTEC

<u>AC Filter Overload</u>	A situation where the harmonic or fundamental current in a filter bank exceeds pre-set limit.
<u>AC Filter Unbalance</u>	A situation where the current in one phase exceeds the current in the other two phases by a pre-set level indicating a faulty component in that phase of a filter bank.
<u>AC Harmonic Filters</u>	<p>A system of capacitors, resistors and inductors arranged and valued such that they are tuned to filter out AC harmonics generated during the conversion process.</p> <p>Generally they are tuned to the 11th and 13th harmonics and to the 23rd and above harmonics (high pass).</p>
<u>Alpha</u>	The name assigned to the valve firing delay, measured in electrical degrees.
<u>Arming</u>	<p>Process of putting into service relaying on a generating unit that is transmitting power across a HVDC system.</p> <p>If the HVDC line trips, the relaying will open the generator breakers, tripping the unit to prevent the AC system overloading. Put in service only when system conditions warrant.</p>
<u>Asynchronous Operation</u>	A mode of operation where two DC converter terminals sequences and power orders are operated individually.
<u>Asynchronous Tie</u>	A tie which connects two electrical systems operating independently at different frequencies and/or phase angles. DC lines are asynchronous ties.
<u>Back to Back</u>	A complete rectifier and inverter system in close physical proximity.
<u>Back to Back Generation</u>	An operational mode where the two poles of a converter terminal are operated independently one as a rectifier, one as an inverter such that the power is transmitted within the facility from the rectifier pole to the inverter pole. This mode of operation is used for testing only.
<u>Bipole</u>	A DC line with one positive and one negative pole.
<u>Bipolar</u>	Operation of HVDC with two poles of opposite

	polarity with negligible ground current.
<u>Blocked</u>	The sequence of control used to stop power flow on pole. See also: stop deblocked.
<u>Bridge</u>	A modular building block portion of a typical converter pole. Example: there are two 6-pulse bridges which comprise one 12-pulse converter.
<u>Bridge Reactor</u>	A high voltage device connected between the DC voltage side and the thyristor valves used to limit current surges.
<u>By-Pass Path</u>	A low resistance path between the DC terminals of one or several bridges. Arm - an unidirectional conducting by-pass path connected only between DC terminals. Pair - two converter arms of a bridge connected to the same AC terminal forming a by-pass path. Switch - a mechanical power switching device connected across the DC terminals of one or more converter bridges to shunt the bridge(s) during the turn-off procedure of the bridge(s) and to commutate current to the by-pass arm or a by-pass pair during the turn-on procedure of the bridge(s).
<u>Commutation</u>	The transfer of current between any two paths with both paths carrying current simultaneously during this process.
<u>Commutation Failure</u>	A fault in a thyristor valve group where the current transfer from one valve to the next is interrupted.
<u>Converter</u>	Is an operative unit comprised of either a rectifier or inverter bridge connected to an AC system through transformers, switching devices and control equipment.
<u>Converter Pulse Number</u>	The number of non-simultaneous symmetrical commutations occurring during any one cycle of AC line voltage.
<u>Converter Transformer</u>	A large AC transformer which transfers the energy from the thyristor valves to the connected AC network.

<u>Current Control</u>	<p>A manual control system, redundant to the power control system, which modifies the DC current flow based on a manual operator entered increase or decrease order.</p> <p>See also: current memory, manual current.</p>
<u>Current Margin</u>	<p>The difference in current orders to the rectifier and inverter which determines power flow direction.</p>
<u>Current Memory</u>	<p>A device used to "track and hold" the DC current value at any given time to reduce the chance of a large transmitted power change in the event of a power control failure during operation.</p>
<u>Current Transductor</u>	<p>A device which measures DC line or neutral bus DC current.</p>
<u>Damping Control</u>	<p>A system used to dampen oscillations in the AC network to which the converters are connected by producing an additional power order which is added to the manually set power order. The value of the additional order is determined by a frequency deviation in the connected AC network.</p> <p>See also: frequency sensitive power control (FSPC).</p>
<u>DC Harmonic Filters</u>	<p>A system of capacitors, resistors, and inductors arranged and valued such that they are tuned to filter out harmonic ripple in the DC current on a DC line. Generally, they are tuned to the 12th harmonic.</p>
<u>DC Hot Line Work</u>	<p>A situation where one pole of a DC system is shutdown for line or insulator repair, while the other pole continue to operate. The DC line protection the operating pole is set for "zero restarts" to prevent that pole from attempting to restart after a line fault.</p> <p>See also: DC line protection.</p>
<u>DC Line Protection</u>	<p>A system which senses low DC line potential or a rapid rate of change in line potential, reduces the potential to zero, then restarts the transmission. If the attempt to restart at normal voltage fails, the system attempts to restart at reduced voltage. The number of restarts at normal and reduced voltage are preset between 0 and 3 attempts at each level. If all restart attempts fail, a "trip" order is given.</p>

<u>Deblocked</u>	When poles at the inverter and rectifier ends are released, a start command is given to the lead station starting power flow across the line at a minimum level of approximately 50 MW. See also: start.
<u>Disarmed</u>	Taking relaying out of service. See also: arming.
<u>Electrode Line</u>	A line connected from the neutral bus of a converter station to a buried ground electrode.
<u>Electrode Line Current Regulator</u>	A device used to maintain zero ground current by issuing an additional power order to the pole to keep them balanced.
<u>Fault Locator</u>	A device used to determine, within a reasonable distance, the location of a DC line fault.
<u>Fiber Optics</u>	Strands of glass fiber used to transmit light pulses. See also: light guides.
<u>Firing Control</u>	A system of control loops, synchronized to the connected AC network, which determines the point at which the thyristor valves fire. See also: valve firing.
<u>First Grade Distribution</u>	The 480 V auxiliary power system which supplies power to the equipment which is essential for operation. (e.g. the current measuring device)
<u>Gamma</u>	The name assigned to the margin of commutation, measured in electrical degrees. See also: margin of commutation.
<u>Glycol System</u>	A closed loop system which circulates a glycol water solution between the heat exchanger and the cooling towers and picks up heat from the cooling air.
<u>Ground Electrode Breaker</u>	A DC circuit breaker which transfers the current from the ground electrode to the DC line conductor of a tripped pole when transferring from ground to metallic return.
<u>Ground Return</u>	Operation of one pole using earth ground as the return path.
<u>Inverter</u>	Is the mode of operation of a converter when energy is transferred from the DC side to the AC side.

<u>Lead Station</u>	The station, rectifier or inverter, in which power orders and sequence changes are initiated.
<u>Make-Up Air System</u>	A system which pressurizes the valve halls, filters the valve hall air, and adds outside air based on valve hall leakage.
<u>Margin of Commutation</u>	A voltage-time area maintained to insure a smooth transfer of current from one thyristor valve to the next. See also: commutation margin.
<u>Metallic Return</u>	Operation of one pole using conductor in the non-operative pole as the return path.
<u>Metallic Return Breaker</u>	A DC circuit breaker which transfers the current from the DC line conductor to the ground electrode when transferring from metallic to ground return.
<u>Monopolar</u>	Operation of HVDC with one pole using either ground as return path or metallic return.
<u>Motor-Generator Set (M-G Set)</u>	A device which contains a 480 V driven motor and a 480 V generator and feeds the first grade distribution to isolate the first grade devices from potential faults on the 480 V power system.
<u>Neutral Bus</u>	The “zero potential” portion of a DC substation connected to the ground electrode system.
<u>Neutral Bus Switch</u>	A DC circuit breaker located in the neutral bus of each DC pole.
<u>Open Line Test</u>	A device used to check the insulation value of a DC line by gradually increasing the DC potential on the line.
<u>Order Setting Unit (OSU)</u>	A computer system, used in the power control mode, which calculates current orders, sets power limitations, and performs ramping to the set power order.
<u>Phase Arrester</u>	High voltage devices connected between AC phases to prevent damage due to over-voltages. See also: surge arrester.
<u>Phase Reactor</u>	High voltage devices connected between the thyristor valves and each AC phase used to limit current surges.

<u>Pole</u>	A rectifier and inverter tied together by a single conductor transmission line with associated filter banks and control equipment.
<u>Pole Release</u>	An order is given to the converter AC breakers to close energizing converter transformer and valves. Thyristors are monitored and checked. No power will flow on DC line at this time.
<u>Power Control</u>	An automatic control system which modifies the DC current flow based on operator entered power and ramp rate values. See also: order setting unit, auto current.
<u>Power Direction</u>	The power direction in a DC link is from the rectifier to the inverter.
<u>Power Order</u>	A value sent to the converter control equipment necessary to raise or lower the DC line power flow.
<u>Ramp Rate</u>	A value in MW/minute which determines the speed at which a given power order channel is reached. This value is entered by the system operator.
<u>Ready Release</u>	A series of tests performed by the control equipment prior to energization of the converter transformers and thyristor valves to ensure that all equipment is operational.
<u>Rectifier</u>	The mode of operation of a converter when energy is transferred from the AC side to the DC side.
<u>Reduced Voltage</u>	A lower-than-normal operating potential used when the DC line insulation is unable to withstand normal operating voltages.
<u>Second Grade Distribution</u>	The 480 V auxiliary power system which feeds all converter building and valve cooling equipment.
<u>Shuntbanks</u>	A system of capacitors used to add mvars to the connected AC system to compensate for the reactive power generated in the converters.
<u>Six Pulse Bridge</u>	An arrangement of six thyristor valves connected to a three phase AC network such that each valve is assigned to conduct during $\frac{1}{2}$ AC cycle.

<u>Smoothing Reactor</u>	<p>A device located on the neutral side of a DC system used to limit current surges to the valve hall.</p> <p>See also: DC reactor.</p>
<u>Start</u>	See deblocked.
<u>Stop</u>	See blocked.
<u>Surge Arrester</u>	<p>A device which internally arcs over in the event of an overvoltage in order to protect the connected devices.</p>
<u>Synchronous Operation</u>	<p>A mode of operation where the two DC converter terminals sequences and power orders are operated synchronously via a telecommunication link.</p> <p>See also: telecommunication.</p>
<u>Tap Changes</u>	<p>Devices in the converter transformers which increase or reduce the potential on the valve thereby controlling DC line voltage.</p>
<u>Telecommunication</u>	<p>A microwave-computer link between two DC converter stations over which power or sequence changes are transmitted.</p>
<u>Thyristor</u>	<p>A semiconductive switching device, also called a silicon controlled rectifier (SCR), which will allow current to flow in one direction only and whose “on-off” switching properties are controllable.</p> <p>See also: thyristor valve, valve firing.</p>
<u>Thyristor Valve</u>	<p>An arrangement of series connected thyristors and thyristor control units connected between the DC line and one phase of the AC line.</p> <p>See also: six pulse bridge, twelve pulse bridge.</p>
<u>Trial Station</u>	<p>The station, rectifier or inverter, which follows the power order or sequence changes initiated by the ready station.</p>
<u>Trip</u>	<p>A sequence where an order to open the converter breakers is given and the transmission is stopped.</p>
<u>Twelve Pulse Bridge</u>	<p>An arrangement of 12 thyristor valves (2-six pulse groups) connected to 6 AC phases such that each valve is assigned to conduct during $\frac{1}{2}$ AC cycle.</p> <p>See also: six pulse group, WYE-WYE/WYE-Delta converter transformer.</p>

<u>Valve Arrester</u>	High voltage devices connected across the thyristor valves to prevent damage to the valve due to overvoltage. See also: surge arrester.
<u>Valve Control Interface Unit (VCI)</u>	A system of electronics used to convert control signals, between the control equipment and the thyristor valves, from light pulses to electronic signals and vice-versa.
<u>Valve Control Unit (VCU)</u>	A system of electronics, located in the valve hall, used to control valve firing.
<u>Valve Cooling System</u>	A system designed to remove heat generated during power transmission consisting of a cooling air system, a glycol system, a make-up air system, and cooling towers.
<u>Valve Firing</u>	The controlled point in time at which a thyristor valve is allowed to conduct current. See also: thyristor, thyristor valve, firing control.
<u>Valve Halls</u>	Buildings which house the thyristor valves and their associated high voltage equipment.
<u>Wind Generator</u>	A device located in the thyristor valve air plenum which provides control voltage for the valve firing and logic control circuits located in the valve control unit.

ABBREVIATIONS AND TERMS

<u>Abbreviation</u>	<u>Word</u>
AC	Alternating Current
AMB	Ambient
ANN	Annunciator
AUTO	Automatic
AUX	Auxiliary
BAT	Battery
BD	Board
BKR	Breaker
BLO	Blower
BPD	Bushing Potential Device
BRCH	Branch
CAB	Cabinet
CAP	Capacitor
CB	Capacitor Bank
CIR	Circulating
CL	Close
CLG	Cooling
CLR	Cooler
CNVTR	Converter
COAX	Coaxial
CONT	Control
CONN	Connection
CT	Current Transformer
CUST	Customer
DC	Direct Current
DEV	Device
DIFF	Differential
DISC	Disconnect
DISTR	Distribution

<u>Abbreviation</u>	<u>Word</u>
ELECTR	Electrode
EMERG	Emergency
EVAP	Evaporator
EXCHG	Exchanger
FILT	Filter
GR	Grade
GRD	Ground
HARM	Harmonic
HP	Hi-Pass
HSG	Housing
HTR	Heater
HUMD	Humidifier
INDC	Indicate
INSTR	Instrument
INTFCE	Interface
JB	Junction Box
LB	Load Break
LGTS	Lights
LC	Lead Covered
LN	Line
LO	Low
MAST	Master
MCC	Motor Control Center
MET	Metallic
MN	Main
MON	Monitor
MOT	Motor
MR	Metallic Return
#NNN	Conduit Number
OP	Open
OPER	Operator

<u>Abbreviation</u>	<u>Word</u>
OVS	Overall Shield
PARALL	Parallel
PH	Phase
PM	Pump
PNL	Panel
POT	Potential
PR	Pair
PRESS	Pressure
PT	Potential Transformer
PWR	Power
REAC	Reactor
REC	Recorder
REL	Relay
RTD	Resistance Temperature Detector
SCR	Silicon Controlled Rectifier
SEQ	Sequence
SER	Sequence of Events Recorder
SHDN	Shutdown
SHTR	Shorting
SNR	Sensor
SOL	Solenoid
SUPV	Supervisory
SUPY	Supply
SW	Switch
SWBD	Switch Board
SWGR	Switch Gear
TEMP	Temperature
THERM	Thermostat
TP	Trip
TR	Transfer
TRNNN	Tray Number

<u>Abbreviation</u>	<u>Word</u>
TRANS	Transformer
TRNST	Transient
TROINT	Tray Internal
TSP	Twisted Shielded Pair
U	Unit
V	Volt
VAL	Valve
VN	Vulkene Neoprene Jacket
VINY	Vinyl
VUL	Vulkene Insulation
VUFR	Vulken Flame Retardent
WHM	Watt Hour Meter

UMW ADPA - DTEC

HYDRO

UMW ADPA - DTEC

<u>Access Tube</u>	The watertight passage providing access between the generator compartment and the powerhouse, and between the turbine compartment and the powerhouse.
<u>Air Valve</u>	The adjustable vent for admitting air to a waterway zone near the runner.
<u>Apron</u>	Protective cover over the edge of a waterfall designed to prevent the water from eroding the rock below the falls.
<u>Band</u>	The lower axisymmetric portion (outer shroud) of the runner to which the lower or outer ends of the runner buckets (or impeller vanes) attach.
<u>Bearing Cover</u>	The radially split cover which closes the oil reservoir and prevents contamination of the bearing oil system.
<u>Bearing Housing</u>	The outer casing of the bearing that supports the shell or shoes (as on the main guide bearing).
<u>Bearing Shell</u>	The removable element containing the material that forms the bearing surface.
<u>Bearing Shoes</u>	The individually adjustable elements of a segmented type journal bearing.
<u>Blade-Control Valve</u>	A pilot-distributing valve combination actuated from the gate movement by a cam. It supplies controlled oil flow to position the runner blade servomotor of an adjustable-blade propeller runner.
<u>Blade Link</u>	The element that connects the rocker arm to the crosshead through the link bolt.
<u>Blade Link Bolt</u>	The element that attaches the link to the crosshead and the rocker arm.
<u>Blades</u>	The contoured components of a propeller runner that radiate from the hub, deflect the flowing water and transfer the energy to the runner hub. The blades may be angularly adjustable or rigidly fixed in the hub.
<u>Blade Servomotor</u>	The hydraulic cylinder actuated by governor oil pressure which supplies the force necessary to adjust the runner blades. The piston is stationary and the cylinder barrel (with integral crosshead) moves axially on suitable supports.

<u>Bottom Ring</u>	The stationary ring which contains the lower wicket gate bushing and provides the water surfaces leading to or from the runner band or discharge ring. It is bolted to the stay ring and may be integral or separate from the discharge ring.
<u>Brake Jet</u>	The water jet that provides the counter-rotational force used to decelerate the runner.
<u>Buckets (Impeller Vanes)</u>	The contoured component of Francis and impulse runners that deflect the flowing water and transfer the energy to the runner crown or disc when operating as a turbine; or that transfer energy to the water when the impeller is operating as a pump.
<u>Bulkhead</u>	Structure provided to close a case subjected to pressure and give access to it. This structure is usually large enough to permit removal of the distributor.
<u>Bushing</u>	A replaceable cylinder or tube inserted in a stationary part, supporting a shaft, trunnion, or stem.
<u>Cam</u>	A multiple-curved wheel operated by gate movement to position the blade-control valve to maintain a predetermined relationship between blade angle and gate opening.
<u>Case</u>	The water passage surrounding the turbine. It is connected to the forebay, conduit, or penstock and distributes flow around the stay ring, wicket gates, and runner.
<u>Cavitation</u>	Turbine wear caused by bubbles that form in areas of low pressure in rapidly flowing water.
<u>Check Valve</u>	An air vent that opens on increasing differential pressure between a negative pressure zone in the water passages and outside atmosphere.
<u>Cofferdam</u>	Watertight structure used for underwater construction work.
<u>Connecting Rods</u>	The element connecting the servomotor piston rod to the gate operating ring.
<u>Coupling Bolts</u>	The fasteners that attach the main shaft to the runner (impeller) and to the generator (motor) or intermediate shaft.

<u>Crosshead</u>	The member that is integral with the blade servomotor. Through link and rock arms, the crosshead transmits the operational force to all blades simultaneously.
<u>Crown</u>	The upper axisymmetric portion (inner shroud) of the runner which provides a mechanical attachment to the main shaft and to which the top, or inner ends of the runner buckets (or impeller vanes) attach.
<u>Deflector</u>	The device within the housing that is actuated by the governor for deflection of all or part of the jet away from the buckets, and thereby regulating the power output with a minimum effect on flow.
<u>Disc</u>	The circular plate on an impulse runner that has provision for the attachment of the main shaft and to the periphery of which the buckets are attached.
<u>Discharge Ring</u>	The structural member on the Francis turbine that surrounds the runner band. On a propeller turbine it surrounds the blades and forms a guide for the water. It may be integrated with the bottom ring. The draft tube liner is attached to the downstream end of the discharge ring.
<u>Distributing Valve</u>	A valve positioned by a servomotor controlled by the pilot valve. It controls the flow of oil (or other media) which, in turn, operates the turbine-flow control mechanism.
<u>Distributor</u>	The assembly which includes the stay ring, wicket gates, head cover, and bottom ring. Its centerline in a vertical machine is a horizontal plane equidistant from the top and bottom of the wicket gates.
<u>Draft Tube</u>	Tube (generally built in the powerhouse structure) that carries water away from the turbine runner. The draft tube functions as a diffuser which regains the residual velocity energy of the water leaving the turbine runner or accelerates the flow as it approaches the pump impeller.
<u>Draft Tube Liner</u>	The steel lining used in the draft tube to protect the concrete from the high velocity of the water.
<u>Drain Valve</u>	The manually operated valve that is used to drain oil from the hub.

<u>Emergency Action Plan</u>	A plan which establishes procedures for notification of proper authorities and outlines steps to be taken in the event of dam failure.
<u>Facing Plates</u>	Replaceable plates attached to the head cover or bottom ring forming the water surface immediately above and below the wicket gates.
<u>Flashboards</u>	Boards that can be placed at the top of a dam to increase the maximum headwater elevation.
<u>Flexible Coupling</u>	The shaft connection between the speed increaser and the generator which can accommodate minor misalignment.
<u>Floating Lever</u>	A lever with several independent moving fulcrums, none of which is fixed.
<u>Flow</u>	The total flow of water through a hydroelectric facility, including the water used to drive the generating units (use) plus any water discharged through taintor gates, stop logs, and/or spillways (waste). Flow is expressed as a rate (e.g., cubic feet per second (cfs)).
<u>Flyball Rod</u>	The rod that transmits motion from the governor head to the pilot valve, usually through a system of levers.
<u>Flyballs</u>	Weights mounted in such a manner as to form a rotating pendulum which is sensitive to speed change.
<u>Flyball Servomotor</u>	A servomotor actuated directly by the governor head which furnishes power to operate the floating lever.
<u>Flyball Spring</u>	A spring arranged to oppose the force of the flyballs in such a manner as to produce the desired relationship between movement and the change in speed and to determine the equilibrium speed of the governor head.
<u>Gate Lever</u>	The arm which is attached to the wicket gate stem to transmit the actuating force from the gate mechanism to the wicket gate.
<u>Gate Linkage</u>	All connecting linkage between the gate operating in and around the wicket gates.
<u>Gate Links</u>	The connected links between the shear lever and the gate operating ring.

<u>Gate Link Pin</u>	The pin connecting the shear lever and the gate link.
<u>Gate Lock</u>	The device used to prevent actuation of the wicket gates by the servomotors.
<u>Gate Mechanism</u>	The components used to actuate the wicket gates consisting of the gate servomotors, the gate operating ring and the gate linkage.
<u>Gate Operating Ring</u>	The ring rotated by servomotors which distributes the force from the servomotors to the individual wicket gate linkages to provide simultaneous movement of all wicket gates.
<u>Gate Servomotors</u>	The hydraulic cylinders actuated by oil pressure which supply the force necessary to operate the wicket gates through the gate operating ring.
<u>Gate Stem</u>	The top or bottom extension of a wicket gate that supports the gate in bearings. The gate lever is connected to one extension.
<u>Gate Thrust Bearing</u>	The annular member made of bronze or a similar bearing material that supports the weight of the wicket gate and gate lever.
<u>Governor</u>	Consists of the governor head and related valves and devices which act on the turbine-flow control mechanism to regulate the speed and load of the turbine.
<u>Governor Head</u>	A speed-sensitive element that produces a mechanical movement which is a function of the change in speed.
<u>Governor Piping</u>	The piping required to interconnect various parts of the governor system (i.e., pressure-tank piping, sump-tank piping, pumping pressure piping, blade servomotor and gate servomotor piping).
<u>Guide Vanes</u>	The streamlined stationary components that span the waterway to provide support for the guide bearing and to provide direction to the water flowing to the runner.
<u>Hand Control Device</u>	The means by which the turbine-flow control mechanism may be operated manually and independent of the governor.

<u>Head</u>	The distance through which water falls, creating the pressure necessary to drive a hydraulic turbine (the vertical distance between the upper water level and the turbine below).
<u>Head Classification</u>	A rather arbitrary division of hydro facilities based on the following approximate ranges: (1) low-head, a few feet up to 50 feet; (2) medium-head, 50 to 150 feet; and (3) high-head, 200 to 5,000 feet.
<u>Head Cover</u>	The axisymmetric structural member in vertical machines that spans the top of the distributor, provides the separation between the watered runner chamber and the dry turbine pit, and supports the main shaft packing box and the main bearing. In propeller and Francis machines, the head cover also supports the upper wicket gate stems and is bolted to the stay ring.
<u>Head Gate</u>	A gate used to control the amount of water that flows into the penstocks.
<u>Headrace</u>	Canal through which water flows to a hydroelectric station.
<u>Housing</u>	The enclosure surrounding an impulse runner which forms the aerated chamber in which runner operates.
<u>H-Ring</u>	The spacer ring inserted between rings of pliable packing in the packing box which permits a circumferential path for distributing lubricants.
<u>Hub</u>	The axisymmetric portion of a propeller runner which provides the attachment to the main shaft and to which the inner ends of the runner blades attach.
<u>Hydraulic</u>	Pertaining to liquids in motion; also, refers to devices that are operated by moving liquid. In the specific case of the electric utility industry, the term "hydraulic" is used interchangeably with the term "hydroelectric" to refer to turbine-generators which convert the inherent energy of water under pressure into electrical energy.

Hydraulic Turbines

Basic Types

Impulse (Pelton): Impulse turbines usually have a horizontal shaft and a single horizontal jet. Impulse units are used in high-head plants, typically where the head is 1000 feet or more.

Reaction: In both types (Francis and propeller) described below, the water passages are completely filled with water.

Francis: Water flows from the scroll case to the runner through guide vanes which impart tangential velocity. Francis turbines are used in facilities with heads up to 1200 feet.

Propeller: High specific-speed turbines used in low-head installations. The increased waterwheel speed of propeller-type units helps reduce the size and cost of the generator and turbine for low-head facilities. Although there is a sacrifice in efficiency for propeller turbines with fixed blades, other propeller turbines use adjustable (Kaplan) blades which automatically change runner-blade angle as guide vanes are opened or closed, thus maintaining more efficient flow conditions. Propeller turbines are used in facilities with heads up to 150 feet.

Hydroelectric

Refers to the production of electricity by turbine-generator that converts the inherent energy in water under pressure into electrical energy. The term “hydroelectric” (or hydro in common usage) is used interchangeably with “hydraulic.”

Inlet Valve

The valve open gate that control water flow through the turbine.

Intake

Canal, flume or concrete passageway that carries water directly to low-head turbines or to the pressure conduit used for medium-head and high-head hydraulic turbines.

Intake Gates

Gate used to control the flow of water into the headrace and to shut off flow to the turbine for safety during maintenance.

<u>Intake Pipe</u>	The connecting water passage from the spiral case to the nozzle assembly.
<u>Lock</u>	Gate canal used to raise or lower boats from one level to another.
<u>Main Guide Bearing</u>	The bearing assembly supporting the main turbine shaft, usually mounted on the head cover. It may be lubricated by oil, grease or water.
<u>Main Shaft</u>	The rotating element that transmits torque developed by the turbine runner to the generator rotor or transmits torque developed by the motor to the pump impeller.
<u>Main Shaft Indicator</u>	The pointer mounted on the bearing cover and aligned with a scribed line on the main shaft. Its purpose is to provide a visual indication of the vertical position of the shaft.
<u>Main Shaft Seal</u>	A seal used to minimize leakage at the main shaft.
<u>Man Door</u>	A door installed to permit access for inspection and maintenance.
<u>Needle</u>	A moving element which is actuated by the governor, the servomotor, or by hand mechanism to control the size of the jet impinging on the bucket.
<u>Nozzle</u>	The shaped water passage which, with the needle, produces the jet and controls the rate of water flow.
<u>Nut Guard</u>	The protective cover over the coupling bolts and nuts.
<u>Oil Basin</u>	The collection reservoir for the main guide bearing oil. It is normally located just below the guide bearing.
<u>Oil Deflector</u>	The ring attached to the main shaft below the bearing which deflects oil into the oil basin.
<u>Oil Head</u>	A distributor, usually mounted on top of the generator, for supplying oil to the blade servomotor through pipes.
<u>Oil-Head Pipes</u>	Concentric oil pipes that pass through the bore in the generator shaft and transmit governor oil to the blade servomotor.

<u>Oil Pump</u>	Provides oil under pressure to operate the governor system.
<u>Operating Rod</u>	A rod that control the blade servomotor piston with the crosshead.
<u>Outer Gate Barrel</u>	The conical section of the outer wall of the water passage which provides the outer support for the wicket gate stem bushings and, in most cases, for the gate operating ring.
<u>Packing Box</u>	An annular chamber surrounding the main shaft; containing pliable sealing material and having removable glands permitting adjustment or replacement of the sealing material.
<u>Peak Shaving</u>	<p>Using relatively low-cost hydro generation during peak periods to reduce the amount of more expensive fossil-fuel generation or purchases power required to meet peak demand.</p> <p>Given a hydro system with pondage capacity, for example, when available flow is not sufficient to operate units at full capacity around the clock, hydro generation will be cut back during off-peak periods to build up the pond(s). Then, during on-peak hours, the pond is drawn down to provide sufficient water flow to operate hydro units at or near full capacity, thereby reducing system costs. During off-peak hours, hydro generation is again cut back to build up the pond.</p> <p>This daily cycle typical continues until such a time that the available flow is sufficient to sustain full output around the clock.</p>
<u>Penstock</u>	Closed conduit that connected the upper reservoir, tunnel, or surge tank with the turbine casing.
<u>Penstock Valve</u>	Valve installed at the intake to the turbine spiral case that allows water flow to be shut off to the associated turbine for safe maintenance and reduced leakage during shutdowns.
<u>Pier</u>	The structure member used to support the upper surface of the horizontal portions of water passages such as the draft tube and spiral case inlet.
<u>Pier Nose</u>	The steel lining used at the upstream ends of the pier.

<u>Pilot Valve</u>	A valve actuated by the governor head and designed to handle a relatively small flow of oil. It responds to the mechanical movements of the governor head and controls the movement of the distributing valve.
<u>Pit Liner</u>	The plate steel lining in the turbine pit. It serves as an internal form and as a protective liner for the surrounding concrete.
<u>Pondage Capacity</u>	Capacity of a reservoir that is used to compensate for short-term differences between stream flow and load demand (cf. storage capacity).
<u>Powerhouse</u>	Structure that encloses and supports the hydraulic turbine, generator, governor, and various auxiliary equipment.
<u>Pressure Conduit</u>	Tunnel, pipeline, or penstock through which water is carried under pressure to medium-head and high-head turbines.
<u>Pressure Regulator</u>	A bypass valve connected to the penstock or spiral case that opens in proportion to the closing movement of the gates and closes slowly upon completion of the gate movement, thus reducing water hammer or pressure rises.
<u>Pressure Tank</u>	A reservoir which contains oil and air under pressure for use in the governing system.
<u>Pumped Storage</u>	In a pumped storage hydro development, water is pumped from a lower reservoir to an upper reservoir during off-peak periods. The, during on-peak periods, the water is returned through the turbine to generate electricity when it is most valuable to the utility.
<u>Reservoir</u>	A natural or artificial lake in which water is stored and systematically discharged to maximize the production of downstream hydro generation (within the constraints imposed by other considerations such as flood control, irrigation, recreation, navigation, and the environment). When a hydro facility has pondage capacity immediately upstream, the reservoir is often referred to as the pond.
<u>Retaining Ring</u>	The removable member of an adjustable-blade runner that holds the blades in the hub.

<u>Rocker Arm</u>	The lever that attaches to the runner blade trunnion and connects to the blade link.
<u>Runner</u>	The rotating element of the turbine that converts hydraulic energy into mechanical energy. For reversible pump/turbines, the element is called an impeller and converts mechanical energy into hydraulic energy for the pump mode.
<u>Runner Blade Trunnion</u>	The shaft segment integral with or bolted to the runner blade. It transfers the rotating action of the operating mechanism to the runner blades and supports the blade in the hub bearings.
<u>Runner Cone</u>	The extension of the crown or hub that guides the water as it leaves the runner.
<u>Runner Hub Assembly</u>	The assembly consisting of the runner hub blades, runner cone and including all of the runner blade operating mechanism that is used to adjust the pitch or angle of the runner blades.
<u>Run-Of-River</u>	A hydro facility that channels a river or waterfalls through turbines using only the natural flow of the water (also known as stream flow hydro).
<u>Seal Ring</u>	The member on an adjustable-blade runner that holds the packing in place around each blade stem.
<u>Servomotor</u>	A cylinder containing a movable piston actuated by governor fluid provided to operate a gate operating ring, adjustable runner blades, or impulse-runner control mechanism.
<u>Shaft Sleeve</u>	The polished stainless steel (or bronze) ring fastened to the shaft to provide a mating surface for the packing.
<u>Shear Lever</u>	The lever attached to the gate lever with the shear pin and connected to the gate operating ring through the gate link.
<u>Shear Pin</u>	The replaceable protective device which is designed to fail by shearing when an obstruction prevents the wicket gate from moving.
<u>Sill Blocks</u>	Bottom edge of the apron that breaks the force of falling water and/or ice chunks. Sill blocks keep a waterfall from undermining itself.
<u>Sleeve</u>	A replaceable protective cylinder or tube which is fashioned to a shaft, Trunnion, or stem.

<u>Sluiceway</u>	Canal that carries excess water away from the headrace to the other side of the hydro plant.
<u>Speed Increaser</u>	The geared drive unit which increases turbine shaft speed to drive the generator at an optimum speed for power generation. The speed increaser contains bearings that provide the necessary shaft support and thrust capacity.
<u>Spillway</u>	The part of a dam or waterfalls over which excess water flows.
<u>Spiral Case</u>	The spiral shaped water passage which completely surrounds the turbine, providing uniform distribution of water flow to the turbine. The upstream end of the spiral case connects to the pressure conduit or penstock.
<u>Stay Ring</u>	The structural member surrounding the wicket gates having two annular rings connected by a number of fixed stay vanes in the water passages. Its function is to provide support and structural continuity between the upper and lower portions of the turbine distributor, while guiding the water as it enters or leaves the spiral case (pump or turbine).
<u>Stay Vanes</u>	The streamlined stationary members which connect the upper and lower annular rings of the stay ring, and provide a rigid connection for the top and bottom turbine structures.
<u>Storage Capacity</u>	Capacity of a reservoir that is used to store water from the wet season to the dry season (cf. pondage capacity). Storage capacity is commonly expressed in acre feet or square mile feet.
<u>Sump Pump</u>	A reservoir for the exhaust of oil from the governing system.
<u>Surge Tank</u>	A standpipe with a tank at the top which is installed somewhere along the pressure conduit to prevent excessive pressure variations during sudden load changes.
<u>Tailrace</u>	Canal that carries water away from hydro station after the water has passed through the turbines.
<u>Tainter Gates (or Waste Gates)</u>	Gates used to discharge water in excess of the portion of river flow that can be used by the generator(s) under various conditions.

<u>Terminal Bearing</u>	A bearing provided in the governor base to carry the gate shaft and absorb the reaction of the terminal lever.
<u>Thrust Bearing</u>	Any bearing used to carry axial forces.
<u>Thrust Cap</u>	The disc that supports the wicket gate to maintain vertical adjustment.
<u>Trash Racks</u>	Racks installed at the inlet to the intake or conduit to protect the turbine from floating debris.
<u>Turbine Pit</u>	The open space on a vertical unit between the head cover and the generator. It provides access to the gate mechanism the main guide bearing, and the packing box.
<u>Turbine Shut-Off Valve</u>	A valve adjacent to the turbine case, the closing of which permits access to the turbine without emptying the penstock.
<u>Turbine Walkway</u>	The platform in the turbine pit which facilitates inspection and servicing of the gate mechanism, the main guide bearing, and the packing box.
<u>Undermine</u>	The breaking up or washing away of an area under falling water.
<u>Use (Consumption)</u>	Refers to the water utilized to drive the generating units of a hydroelectric facility (expressed as a rate) e.g., cubic feet per second (cfs).
<u>Valve Body</u>	A supporting case with suitable oil passages which encloses the valve.
<u>Valve Bushing</u>	A sleeve within which the plunger slides and which is provided with suitable distributing parts.
<u>Valve Plunger</u>	The moving portion of the valve which has sharp-edged surfaces and regulates the flow of the oil.
<u>Valve Rod</u>	A stem, by means of which the valve plunger is actuated.
<u>Valve Servomotor</u>	Actuates the pilot valve or distributing valve.
<u>Vaned Intake Ring</u>	The structural member in a tubular unit consisting of the outer conical ring, guide vanes, and inner ring which supports the main guide bearing.

Waste

Waste discharged through the taintor gates storelogs and/or spillways (referred to as “waste” because this portion of the flow is not utilized in generating electricity). Waste is expressed as a flow rate (e.g., cubic feet per second (cfs)).

Water Deflector

The ring attached to the main shaft which slings leakage water to the head cover drainage system.

Wearing Rings

Replaceable rotating rings fastened to the runner or adjacent stationary rings fastened to the head cover and the bottom ring (or discharge ring), forming removable seals with small clearances.

Wicket Gates

The angularly adjustable streamlined elements which control the flow of water to the turbine or discharge from the pump.

UMW ADPA - DTEC

NUCLEAR

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<u>Absorbed</u>	As radiation passes through matter, some of its energy is imparted to the matter.
<u>Absorber</u>	Material that absorbs or diminishes the intensity of ionizing radiation; or alters the energy spectrum of the radiation.
<u>Absorption</u>	Process where the number of particles or protons entering matter is reduced by interaction of the particles of radiation with the matter.
<u>Accelerator</u>	A device for increasing the velocity and energy of electrically charged subatomic particles such as electrons, positrons and protons through the application of electromagnetic forces.
<u>Actinides</u>	Heavy elements with an atomic number greater than 89 and includes uranium (U) and plutonium (Pu).
<u>AIF</u>	Atomic Industrial Forum. An international organization or corporate members supporting development of peaceful nuclear energy uses.
<u>Activation</u>	Process of making a material more radioactive. Also called radioactivation. The process raises the energy states of the atom within the molecules of the material.
<u>Activation Analysis</u>	Method of identifying and measuring chemical elements in a sample of material.
<u>Aftercooling</u>	Cooling of a reactor after it has been taken off the power grid. (Shutdown cooling)
<u>Afterheat</u>	Heat produced by the continuing decay of radioactive atoms in a reactor. (Decay Heat)
<u>Air Sampling</u>	Collection and analysis of air samples to measure their contamination with radioactive substance.
<u>Alert</u>	A classification of events which are in progress (or have occurred or which are expected to occur) which involve actual or potential substantial degradation of the level of safety in a nuclear generating plant. The Emergency plan is activated at this level.

<u>Allobar</u>	Element differing in atomic weight from the usually occurring form. See also: isotope.
<u>Alpha Particle</u>	A positively charged particle containing two protons and two neutrons (the nucleus of a helium atom) emitted by certain radioactive materials. Alpha particles can be stopped by a sheet of paper.
<u>American Nuclear Society (ANS)</u>	An international organization of scientists and engineers to promote research and education to advance nuclear science and engineering.
<u>Angstrom</u>	Unit of length, used in measuring electromagnetic radiation, equal to 10^{-8} centimeter.
<u>Atom</u>	A unit of matter consisting of a nucleus, composed of protons, neutrons, and orbiting electrons. The number of electrons is equal to the number of protons in the nucleus. That smallest subdivision into which an element can be divided and still maintain the properties of that element.
<u>Atomic Clock</u>	Device that uses the extremely fast vibrations of molecules to measure time. These vibrations remain constant with time and thus short intervals can be measured with much greater precision than by other means.
<u>Atomic Energy</u>	A term sometimes used to denote nuclear energy. The energy that is released when the nucleus is disintegrated into its constituent particles. (Binding Energy)
<u>Atomic Mass</u>	The mass of a neutral atom compared with $1/12^{\text{th}}$ of the mass of the carbon-12 atom.
<u>Atomic Number</u>	Number of protons (positively charged particles) found in the nucleus of an atom. All elements have a different atomic number.
<u>Atomic Weight</u>	Mass of an atom relative to other atoms.
<u>Auto-Radiograph</u>	Photographic record of radiation from radioactive material in an object, made by placing the object close to film or emulsion.
<u>Backscatter</u>	That radiation which strikes matter and is reflected or scattered back in the direction of the source.

<u>BWR</u>	Boiling Water Reactor. A reactor system in which water is allowed to boil in the reactor. The resulting steam can be used directly to drive a turbine.
<u>Background Radiation</u>	Radiation from natural sources, including cosmic rays, rocks and minerals. Normal background radiation for American average 100 millirems per year, with higher figures occurring at higher altitudes.
<u>Barricade Shield</u>	Movable shield for protection from radiation.
<u>Barrier Shield</u>	Wall or enclosure shielding personnel from an area where radioactive material is being used or processed by remote control.
<u>Baryon</u>	One of a class of heavy elementary particles.
<u>Beam</u>	Stream of particles or electromagnetic radiation traveling in a straight line.
<u>Beam Hole</u>	Opening through a reactor shield which allows a beam of radioactive particles to be used for experiments outside the reactor.
<u>Beta Particle</u>	A negatively charged electron emitted from the nucleus of an atom during radioactive decay. A beta particle can be stopped by less than an inch of wood or a thin sheet of aluminum.
<u>Blanket</u>	A layer of fertile material, such as uranium-238 or thorium-232, placed around the fissionable material in a nuclear reactor.
<u>Body Burden</u>	Amount of radioactive material present in the body of a human or animal.
<u>Bone Seeker</u>	An element that tends to accumulate in the bones when it is introduced into the body. Strontium-90 is a radioactive example.
<u>Breeder Reactor</u>	A reactor which produces more fissionable material (nuclear fuel) than it consumes. The new fissionable material is created by capture in fertile materials of neutrons from fission. This process is known as breeding.
<u>Burnup</u>	A measure of nuclear reactor fuel consumption. It can be expressed (a) the percentage of fuel atoms that have undergone fission, or (b) the amount of energy per unit weight of fuel in the reactor.

<u>By Product Material</u>	Any radioactive material obtained during the production or use of source material or fissionable material.
<u>Calandria</u>	A cylindrical reactor vessel which contains the heavy water moderator. Hundreds of tubes extend from one end of the calandria to the other containing the uranium fuel and the pressurized high temperature coolant. The reactor core consists of all of the components within the calandria.
<u>CANDU</u>	A Canadian developed nuclear power reactor system. The name is derived from CANada Deutrium Uranium, indicating that the moderator is deuterium or heavy water, and that the fuel is natural uranium. Pressure tubes containing the fuel and coolant run the length of the reactor Bessel or calandria.
<u>CANFAS</u>	Computer Assisted Nuclear Fuel Accountability System. A program to measure the amount of nuclear fuel burnup and to compute the dollar value of the fuel for accounting purposes.
<u>Carrier</u>	Stable isotope, or a normal element, to which radioactive atoms of the same element can be added to obtain a quantity of radioactive mixture sufficient for handling.;
<u>Capture</u>	A nuclear reaction in which a nucleus absorbs an additional neutron or proton. If it is a neutron the mass number of the nucleus increases by one and a different isotope results; if it is a proton both the mass number and atomic number increase by one and a different element results.
<u>Cascade</u>	Connected units of equipment for separation of isotopes.
<u>Chain Reaction</u>	A reaction that stimulates its own repetition. In a fission chain reaction, a fissionable nucleus absorbs a neutron and fissions, releasing additional neutrons.
<u>Chemical Shim</u>	Chemical which are placed in a reactor coolant to control the reactor by absorbing neutrons.

<u>China Syndrome</u>	A figure of speech which refers to a total meltdown of a nuclear reactor core such that the molten core penetrates the reactor vessel and floor of the containment building and melts into the earth below (in fantasy, through the earth to China).
<u>Cladding</u>	The outer covering, usually a zirconium alloy, or a nuclear fuel element. The cladding serves as a barrier to prevent the release of radioactivity into the coolant and prevent corrosion of the fuel by the coolant.
<u>Coffin</u>	Heavily shielded shipping cask for spent fuel elements.
<u>Cold Shutdown</u>	A reactor condition in which the coolant had been reduced to below saturation temperature and the pressure has been essentially reduced to atmospheric pressure.
<u>Containment</u>	The prevention of release of unacceptable quantities of radioactive material beyond a controlled area, even under the conditions of a reactor accident. Also, commonly, the containment system itself.
<u>Containment Vessel</u>	Gas tight shell or other enclosure around a reactor.
<u>Control Rod</u>	A rod containing a material such as boron or hafnium used to control the power of a nuclear reactor. By absorbing neutrons, a control rod, when inserted into the fuel core, ceases or halts the chain reaction by which the reactor generates heat.
<u>Control Room</u>	Operations Center for a nuclear power plant. From this Center, operations can be controlled and monitored.
<u>Converter Reactor</u>	A reactor that produces some fissionable material, but less than it consumes. In some usages, a reactor that produces a fissionable material different from the fuel burned, regardless of the ratio. In both usages, the process is known as conversion.
<u>Coolant Primary</u>	Liquid or gas circulated through a nuclear reactor to remove or transfer heat.

<u>Core</u>	The region of a nuclear reactor containing the nuclear fuel in which a chain reaction can take place.
<u>Critical</u>	Capable of sustaining a chain reaction.
<u>Critical Mass</u>	The smallest amount of nuclear fuel necessary to sustain a chain reaction.
<u>Criticality</u>	The point at which a nuclear reactor is just capable of sustaining a chain reaction.
<u>Curie</u>	The basic unit to describe the intensity of radioactivity in a sample of material. The curie is equal to 37 billion disintegrations per second, which is approximately the rate of decay of one gram of radium.
<u>Cutie Pie</u>	Common radiation survey meter used to determine exposure levels or to locate possible radiation hazards.
<u>Decay</u>	The decrease in activity of a radioactive material as it spontaneously disintegrates from one nuclide to another or into a different energy state of the same nuclide.
<u>Decay Heat</u>	Heat generated by decaying radioactive products of the fission process.
<u>Decommissioning</u>	The process of permanently retiring a power plant. For a nuclear generating plant, the process involves storage or disposal of radioactive components that could endanger public safety.
<u>Depleted Fuel</u>	See spent fuel.
<u>Design Basis Accident</u>	Hypothetical accidents evaluated during safety reviews of nuclear power plants. Plants are required to have safeguards that will ensure that radiation releases off-site will be within 10CFR limits should any accidents occur.
<u>Deuterium</u>	A stable naturally occurring hydrogen isotope (H_2) with a mass number of two. Its natural abundance is about one part in 7000 of hydrogen. In the form of heavy water (D_2O) it is an effective neutron moderator available for reactors with low enrichment fuels.
<u>Disintegration</u>	See decay.

<u>Dollar</u>	Unit of reactivity. One dollar is the amount of reactivity in a reactor due to the delayed neutrons alone. Delayed neutrons result from decay of fission products rather than from fission.
<u>Doppler</u>	Shift with temperature on the interaction rate between neutrons and reactor materials. Shift can affect the neutron density.
<u>Dose</u>	The amount of ionizing radiation energy absorbed per unit mass.
<u>Dose Equivalent</u>	Term used to express the amount of effective radiation when modifying factors have been considered. Expressed numerically in rems.
<u>Dose Rate</u>	Radiation dose delivered per unit time and measured in rems per hour.
<u>Dosimeter</u>	A device, such as a film badge, which can be worn and used to measure the radiation dosage a person receives over a period of time.
<u>Electron</u>	A subatomic particle with a negative electrical charge and a mass of 1/1837 of a proton.
<u>Element</u>	Basic substance consisting of a family of isotopes. All atoms of an element contain a definite number of protons and thus have the same atomic number.
<u>Emergency Core Cooling System</u>	A series of backup safety systems designed to dump thousands of gallons of water into a nuclear reactor, thus preventing overheating the core in the event the normal core cooling system fails.
<u>Enrichment</u>	A process by which the U-235 content of uranium is increased for use as power plant fuel (low enrichment) or weapons (high enrichment). The process itself, called gaseous diffusion is classified by the federal government. All uranium enrichment is done by the federal government under the administration of the Department of Energy (DOE).
<u>Excited State</u>	State of a molecule, atom, electron or nucleus when it possesses more than its normal energy.
<u>Exclusion Area</u>	Area immediately surrounding a nuclear reactor where human habitation is prohibited to insure safety in the event of an accident.

<u>Excursion</u>	Sudden, very rapid rise in the power level of a reactor.
<u>Fast Neutrons</u>	Neutrons resulting from fission or decay of fission products that are not intentionally slowed down by a moderator.
<u>Feed Materials</u>	Refined or pure uranium or thorium metal suitable for use in nuclear reactor fuel elements or as feed for uranium enrichment process.
<u>Fission</u>	The splitting or breaking apart of a heavy atom into two new atoms. When a heavy atom, such as uranium, is split, large amounts of kinetic energy and one or more neutrons are released.
<u>Fission Products</u>	Atoms formed when uranium is split by nuclear fission. Fission products are usually radioactive.
<u>Film Badge</u>	Light-tight package of film worn like a badge by employees to measure possible exposure to radiation.
<u>Flux</u>	Measure of intensity of neutron radiation.
<u>Fuel Assemblies</u>	Fuel rods bundled together. The core of a large commercial nuclear reactor contains several hundred fuel assemblies. Depending upon the model, each assembly can contain 49 or more rods.
<u>Fuel Bundle</u>	An assembly of metal tubes containing nuclear fuel pellets ready for insertion in a reactor.
<u>Fuel Cycle</u>	The complete series of steps involved in supplying fuel for nuclear reactors and disposing of the waste. It includes mining, refining, enrichment, fabrication of fuel elements, use of a reactor chemical processing to recover that fissionable material remaining in the spent fuel, re-enrichment of the fuel material, refabrication of new fuel elements and management of radioactive waste. Operations prior to irradiation in the reactor are termed "front end" and steps afterward are termed "back end."
<u>Fuel Element</u>	A tube or rod filled with fissionable material for use in a nuclear reactor.
<u>Fuel Pellet</u>	Dense, cylindrical pellets of enriched uranium dioxide. Each pellet ($\frac{1}{4}$ inch x $\frac{1}{4}$ inch) contains as much energy as about one ton of coal.

<u>Fuel Reprocessing</u>	The processing of used nuclear reactor fuel to separate chemically the reusable uranium and plutonium from the waste products.
<u>Fuel Rods</u>	See fuel element.
<u>Fuel Sheath</u>	Tubing into which fuel pellets are inserted and sealed to make a fuel element. A number of elements are assembled to make a fuel bundle.
<u>Fused Salt Reactor</u>	Type of reactor that used molten salts of uranium for both fuel and coolant.
<u>Fusion Reaction</u>	Reaction between two light nuclei resulting in the production of nuclear element heavier than either initial nucleus but less than the sum of the two. This reaction releases excess energy.
<u>Gamma Rays</u>	High energy, highly penetrating, short wave length electromagnetic radiation emitted by the nuclei of many radioactive atoms during radioactive decay. The rays are absorbed by dense materials like lead.
<u>Gas Cooled Reactor</u>	A nuclear reactor in which gas, such as carbon dioxide or helium, is used as the coolant.
<u>Gauging</u>	Measurement of the thickness, density or quantity of material by the amount of radiation it absorbs.
<u>Geiger Counter</u>	An instrument, named for one of its inventors, for detecting radiation. It contains a small tube of gas which conducts electrically when struck by ionizing radiation. This pulse of electricity operates an indicating meter and can be amplified to produce audible sounds.
<u>Genetic Effects</u>	Effects that produce changes to egg or sperm cells and thereby affect the offspring.
<u>Generation Time</u>	Mean time for the neutrons produced by one fission to produce fissions again in a chain reaction.
<u>Glove Box</u>	Sealed box where workers can handle radioactive materials safely from the outside.
<u>Graphite</u>	Very pure form of carbon used as a moderator in some nuclear reactors.
<u>Ground State</u>	State of a nucleus, atom or molecule at its lowest energy level.

<u>Half-Life</u>	The time in which half the atoms in a radioactive substance disintegrate into another nuclear form. Measured half-lives vary from millionths of a second to billions of years.
<u>Half-Thickness</u>	Thickness of any given absorber that will reduce the intensity of a beam of radiation to one-half its initial value.
<u>Hand/Foot Counter</u>	Monitoring device arranged to give rapid radiation survey of hands and feet of persons working with radioactive materials.
<u>Health Physics</u>	Science concerned with recognition, evaluation and control of health hazards from radiation.
<u>Heat Exchanger</u>	Device which transfers heat from one material to another substance with no direct contact between the two materials.
<u>Heat Sink</u>	Anything that absorbs heat; usually part of the environment.
<u>Heavy Water</u>	The moderator used in the CANDU nuclear power reactor system.
<u>High-Level Wastes</u>	These wastes have a high content of long lived radioactive isotopes and required long-term isolation from the environment. Most the high-level wastes from power plant currently are contained within the spent fuel being stored temporarily at nuclear generating plants.
<u>Hot</u>	Highly radioactive.
<u>Hot Cell</u>	Heavily shielded enclosure where radioactive materials can be handled by persons using remote manipulators and viewing the materials through shielded windows or periscopes.
<u>Hot Laboratory</u>	Laboratory designed for the safe handling or radioactive materials.
<u>Hot Spot</u>	Surface area of higher-than-average radioactivity. Also a part of a fuel element surface that has become overheated.
<u>Hydrogen Recombiner</u>	Device which combines hydrogen with oxygen producing water. In this manner, a recombiner is used to separate hydrogen from other gases.

<u>IE</u>	Inspection and Enforcement office of the Nuclear Regulatory Commission (NRC). This office issues reports periodically to operators of nuclear generating plants.
<u>Induced Radioactivity</u>	Radioactivity that is created when substance are bombarded with subatomic particles.
<u>In-Pile</u>	Terms used to designate experiments or equipment inside a reactor.
<u>INPO</u>	Institute of Nuclear Power Operations, established in 1979 to set industry-wide benchmarks for excellence in nuclear operation and to conduct independent evaluations to assist utility companies me meeting the benchmarks.
<u>Ion</u>	An atom or molecule that has lost or gained one or more electrons. By this ionization it becomes electrically charged.
<u>Ion Exchange</u>	Chemical process involving the reversible interchange of various ions between a solution and a solid material.
<u>Ionization Chamber</u>	Instrument that detects and measures ionizing radiation by measuring the electrical current that flows when radiation ionizes gas in a chamber, making the gas a conductor of the electricity.
<u>Irradiation</u>	Exposure to radiation, as in a nuclear reactor.
<u>Isolation</u>	(Containment Isolation) The closing of all penetrations to containment to contain any radioactive materials which might be release din a nuclear accident inside the containment building.
<u>Isotope</u>	Nuclei of the same element which have the same atomic number but different masses called isotopes. They contain the same number of protons but a different number of neutrons.
<u>Leakage</u>	Escape of neutrons from a reactor core.
<u>Lethal Dose</u>	Dose of radiation sufficient to cause death.
<u>LER</u>	Licensed Event Report. Report required from the operator of any licensed nuclear facility to the Nuclear Regulatory Agency in the event of unusual or accidental occurrences in the operation of the facility.

<u>LMFBR</u>	Liquid Metal Fast Breeder Reactor. A fast breeder nuclear reactor that used liquid metal, such as sodium, as a coolant. Fast breeders use fast neutrons (more energy-laden neutrons) to sustain the nuclear chain reaction. The reaction takes place with little or no moderating substance to slow the process. Fast breeder reactors will produce more fissionable material than they consume.
<u>LWR</u>	Light Water Reactor. A reactor system that uses ordinary (light) water in the reactor to slow down the high-velocity neutrons, thus increasing the likelihood of further fission.
<u>Loss of Coolant (LOCA)</u>	An accident involving broken pipe, stuck open valves or other leak in the reactor coolant system that results in a loss of cooling water.
<u>Low-Level Analysis</u>	Procedure to measure the radioactive content of materials with very low levels of activity, using sensitive detecting instruments and with good shielding to eliminate the effects of background radiation and cosmic rays.
<u>Low-Level Wastes</u>	Nuclear wastes in the range of one microcurie per gallon or cubic foot. These wastes from a nuclear reactor do not contain significant amounts of highly active isotopes.
<u>Manipulators</u>	Mechanical devices used for safe handling of radioactive materials.
<u>Maximum Permissible Dose (MPD)</u>	An established limit on the radiation exposure a member of the general public can legally receive from any source of radioactivity, such as a nuclear plant.
<u>Mass Number</u>	The total number of protons and neutrons in the nucleus of an atom.
<u>Meltdown</u>	The overheating of a reactor core (above 5000 F) usually as a result of a loss of coolant, to the extent that the uranium oxide melts through the metal cladding on the fuel rod. It has been hypothesized that if an entire reactor core were to overheat, it could melt through a plant's steel and concrete structure to the groundwater and release radiation.

<u>Mill</u>	A process in the uranium fuel cycle in which ore that contains only about 0.2 percent uranium oxide is concentrated into a compound called yellowcake, which contains 80-90 percent uranium oxide.
<u>Millirem</u>	The measure of biological exposure of radiation of human beings. A millirem is one-thousandth of a rem, the basic measure of radiation.
<u>Moderator</u>	A material such as ordinary water, heavy water or graphite used in a reactor to slow down high-velocity neutrons, thus increasing the likelihood of further fission.
<u>Molecule</u>	The smallest piece of substance that still retains the characteristics of that substance. A further subdivision would break down the substance into its constituent atoms.
<u>Natural Uranium</u>	Uranium whose isotopic composition as it occurs in nature has not been altered.
<u>NRC</u>	Nuclear Regulator Commission (formally the Atomic Commission). A federal agency responsible for licensing nuclear power plants. It is also responsible for setting and enforcing plant security and safety standards.
<u>NRR</u>	Nuclear Regulatory Research office of the federal Nuclear Regulatory Commission (NRC).
<u>NSAC</u>	Nuclear Safety Analysis Center. The center was established in April 1979 to analyze the Three Mile Island accident, develop strategies to minimize the possibility of a future nuclear accident and address generic issues.
<u>Neutron</u>	An elementary particle in the nucleus of an atom having no electric charge. The mass of a neutron is slightly greater than the mass of a proton. Neutrons are the particles that sustain a chain reaction in a nuclear reactor.
<u>Noble Gases</u>	Gases which do not combine chemically with other materials.

<u>Nuclear Energy</u>	The energy liberated by a nuclear reaction (fission or fusion) or by radioactive decay. When released in sufficient and controlled quantity, this heat energy can be used to produce steam to drive a turbine-generator and thus be converted into electrical energy
<u>Nuclear Power Plant</u>	Facility designed and operated to utilize nuclear energy to produce steam to drive a turbine-generator and thus be converted into electrical energy.
<u>Nuclear Reactor</u>	A vessel in which a fission chain reaction can be initiated, maintained and controlled. Its essential components are a core with fissionable fuel, coolant, moderator and control rods/liquids.
<u>Nuclear Waste</u>	See waste, radioactive.
<u>Nucleus</u>	The inner core of the atom, consisting primarily of neutrons and protons. Although the nucleus is only 1/10,000 of the diameter of an atom, it contains nearly all the mass of the atom.
<u>Orbit</u>	Region occupied by an electron as it moves around the nucleus of an atom.
<u>Organic Coolant</u>	An oil-like liquid having a high boiling point a low pressure used as coolant.
<u>PWR</u>	Pressurized Water Reactor. A power reactor in which heat is transferred from the core to a heat exchanger by water kept under high pressure to achieve high temperature without boiling in the primary system. Steam is generated in a secondary system.
<u>Plutonium</u>	A heavy, radioactive, man-made, metallic element with atomic number 94. Its most important isotope is fissionable plutonium-239, produced by neutron irradiation of uranium-238. It can be used as nuclear fuel for Fast Breeder Reactors, but is used primarily for weapons.
<u>Power Density</u>	Rate of heat generated per unit volume of a reactor core.
<u>Pressure Tube Reactor</u>	A power reactor in which the fuel is located inside hundreds of tubes designed to withstand the circulating of high pressure coolant. The tube are assembled in a tank containing the moderator at low pressure.

<u>Prompt Criticality</u>	Sate of a reactor when the fission chain reaction is sustained solely by prompt neutrons.
<u>Prompt Neutrons</u>	Neutrons that are emitted immediately in nuclear fission.
<u>Proton</u>	One of the basic particles of the atomic nucleus (other is the neutron). Its charge is as large as that of the electron, but positive.
<u>Protection</u>	Provisions to reduce exposure of persons to radiation.
<u>Protective Clothing</u>	Special clothing worn by individuals to prevent contamination of the body and personal clothing.
<u>Protective Survey</u>	Evaluation of the radiation hazards incidental to the production, use, for existence of radioactive materials or other sources of radiation.
<u>RAD</u>	Radiation Absorbed Dose. The basic unit of absorbed does of ionizing radiation. The amount of energy absorbed by a substance as radiation passes through it.
<u>Radiation</u>	Also called ionizing radiation. Energy released from a material in the form of ray or particle thrown off by disintegrating atoms. Alpha, Beta, neutron and gamma radiation are the most common kinds.
<u>Radiation Accident</u>	Accidents resulting in the spread of radioactive materials or in the exposure of individuals to radiation.
<u>Radiation Area</u>	Any accessible area in which the level of radiation is such that a major portion of an individual's body could receive in any one hour a dose in excess of 5 millirem.
<u>Radiation Burn</u>	Radiation damage to the skin; usually from the skin being contaminated by Beta emitting particles which only penetrate the outer layers of skin.
<u>Radiation Damage</u>	General term for the harmful effects of radiation on matter.
<u>Radiation Detection Instruments</u>	Devices that detect and/or record the characteristics of radiation.
<u>Radiation Illness</u>	Acute organic disorder that follows exposure to relatively server doses of radiation.
<u>Radiation Monitoring</u>	Continuous or periodic determination of the amount of radiation present in a given area.

<u>Radiation Protection Guide</u>	Officially determined radiation doses which should not be exceeded without careful consideration of the reasons for doing so.
<u>Radiation Shielding</u>	Reduction of radiation by placing a shield of absorbing material between any radioactive source and a person.
<u>Radiation Standards</u>	Exposure standards, permissible concentrations, rules for safe handling, regulations for transportation, regulations for industrial control of radiation, and control of radiation exposure by legislative means.
<u>Radioactivity</u>	A natural and spontaneous process by which unstable atoms emit the excess energy of the nuclei as particles or protons.
<u>Radioactive Contamination</u>	Deposition of radioactive material on any place where it may harm persons, soil or make products/equipment unsafe.
<u>Radioactive Waste</u>	See waste, radioactive.
<u>Reactivity</u>	A measure of the departure of a reactor from criticality. A positive value means that the release of neutrons is increasing and that the power will rise, and a negative value means that the release of neutrons is decreasing, the power is falling and the chain reaction could die out.
<u>Reactor</u>	A vessel in which a fission chain reaction can be initiated, maintained and controlled. Its essential components are a core with fissionable fuel, coolant, moderator and control rods/liquids.
<u>Reactor Trip</u>	An automatic procedure by which control rods are rapidly inserted into the core of a nuclear reactor to stop the chain reaction.
<u>Recycling</u>	The reuse of fissionable material and some fission products in irradiated nuclear fuel which is recovered by reprocessing.
<u>Regulating Rod</u>	Reactor control rod used for making frequent fine adjustments in reactivity. (Compare shim rod)
<u>Relief Valve</u>	Valve that will automatically open to release steam and prevent pressure increases.
<u>Rem</u>	The unit of dose of any ionizing radiation which produces the same biological effect as a unit of absorbed dose of ordinary x-rays.

<u>Reprocessing</u>	The processing of nuclear fuel after its use in a reactor to remove fissionable material and other isotopes. Spent, or used, reactor fuel is being stored temporarily in the U.S.
<u>Re-Rack</u>	The process of rearranging spent nuclear fuel rods within a designated storage area.
<u>Residual Heat Removal System (RHRS)</u>	System designed to remove the small quantity of heat that continues to be produced by the core after the reactor is shut down and the fission process is completed.
<u>Retrofitting</u>	Modifying existing structures, devices or procedures to bring about a desire or required change.
<u>Rod</u>	A relatively long, slender body of material used in or in conjunction with a nuclear reactor. It might contain fuel, absorber, or material in which activation or transmutation is desired. A standby "safety rod" is used to shut down a reactor rapidly in emergencies.
<u>Roentgen</u>	A unit for measuring gamma or x-ray radiation. The roentgen is defined by the amount of energy absorbed by air as radiation passes through it.
<u>Safety Rod</u>	A neutron absorber rod used for emergency shutdown of a nuclear reactor. (Contrast with Control Rod)
<u>Scaler</u>	Electronic instrument for rapid counting of radiation-induced pulses from Geiger counters to other radiation detectors.
<u>Scram</u>	The rapid shutdown of a nuclear reactor by inserting control rods into the core to halt fission.
<u>Shielding</u>	Materials such as lead, concrete and water used to stop radiation and to protect workers and equipment in a nuclear generating station.
<u>Shim Rod</u>	Reactor control rod used to make infrequent coarse adjustments in reactivity.
<u>Shutdown Reactor</u>	The procedure to make a nuclear reactor sub-critical, or the state of a reactor in a sub-critical condition.
<u>Slow Neutron</u>	Neutrons that have been slowed down by a moderator so as to increase the probability of their inducing fission once absorbed by nucleus.

<u>Specific Power</u>	Power generated in a nuclear reactor per unit mass of fuel.
<u>Spent Fuel, Nuclear</u>	Nuclear fuel that has been irradiated (used) to the extent it can no longer effectively sustain a chain reaction. Spent fuel can be reprocessed for additional use.
<u>Spent Fuel Pool</u>	Pool constructed of reinforced concrete used for the underwater storage of spent fuel assemblies after their removal from the reactor core.
<u>Spill</u>	Accidental release of radioactive material.
<u>Surface Contamination</u>	Disposition and attachment of radioactive materials to a surface.
<u>Survey Meter</u>	Portable device used for surveying or inspecting an area to establish the existence and amount of radioactive material present.
<u>Survival Curve</u>	Curve obtained by plotting the number or percentage of organisms surviving at a given time against the dose of radiation.
<u>Thermal Burn</u>	Burn of the skin or other organic material due to radiant heat.
<u>Thorium</u>	A heavy slightly radioactive metallic element with an atomic number of 90 whose natural occurring isotope Th-232 is fertile and the source, when irradiated in a reactor, of U-233.
<u>Threshold Dose</u>	Minimum dose of radiation that will produce a detectable biological effect. (Theory)
<u>Triage</u>	Medical terms used to identify process of determining which casualties should be treated first.
<u>Transient</u>	An abnormal change of conditions or events in a nuclear power plant.
<u>Unusual Events</u>	Events which are in progress or have occurred which indicate potential degradation of the level of safety of a nuclear power plant. The nature of these events could be of concern, but are below the threshold for emergencies which require immediate public notification through the state and County Emergency Facilities. (EBS)

<u>Uranium</u>	A radioactive element with atomic number 92 and, as found in natural ores, an average atomic weight of approximately 238. The two principal natural isotopes are uranium-235, which is fissionable and uranium-238, which is fertile and constitutes about 99% of the uranium in nature.
<u>Uranium Dioxide</u>	Used with natural concentration of U-235 unchanged, as the fuel in CANDU power reactors because of its chemical and radiation stability, good gaseous fission product retention and high melting point.
<u>Uranium Hexafluoride</u>	Volatile compound of uranium and fluorine. UF ₆ gas is the process fluid.
<u>Use Charge</u>	Annual rental charge assessed by the NRC.
<u>Void Coefficient</u>	Rate of change in the reactivity of a water reactor system resulting from a formation of steam bubbles as the power level increases in a saturated condition.
<u>Waste, Radioactive</u>	Radioactive equipment and materials for which there is no further use. Wastes generally are classified as high-level (having radioactivity concentrations of hundreds to thousands of curies per gallon or cubic foot), low-level (in the range of 1 micro-curie per gallon or cubic foot) or intermediate (between these extremes).
<u>Wet Criticality</u>	Reactor criticality achieved with the coolant present.
<u>Yellow-Cake</u>	See milling.
<u>Z</u>	Symbol for atomic number. The number of protons/electrons in an atom.
<u>Zirconium</u>	A metallic element, resistant to corrosion, an alloy of which is used as cladding on nuclear fuel elements.