



GLOSSARY

DISTRIBUTION INTERCONNECTION HANDBOOK

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A

Access Charge: A charge paid by all UDCs, MSSs and, in certain cases, Scheduling Coordinators delivering energy to Gross Load, as set forth in Section 7.1 of the ISO Tariff. The Access Charge includes the High Voltage Access Charge, the Transition Charge, and the Low Voltage Access Charge

ADR (Alternative Dispute Resolution): Process described in the ISO Tariff Section 13 and the TCA Section 15 for settling disputes between parties.

AGC (Automatic Generation Control): Generation equipment that automatically responds to signals from the ISO's EMS control in real time to control the power output of electric generators within a prescribed area in response to a change in system frequency, tie line loading, or the relation of these to each other, so as to maintain the target system frequency and/or the established interchange with other areas within the predetermined limits.

Alternating Current (AC): That form of electric current that alternates or changes in magnitude and polarity (direction) in what is normally a regular pattern for a given time period called frequency.

Ampere: The unit of current flow of electricity. Analogous to quantity per unit of time when referring to the flow of water. One ampere is equal to a flow of one coulomb per second.

- * **Applicable Reliability Criteria:** The reliability standards established by [NERC](#), [WSCC](#), and Local Reliability Criteria as amended from time to time, including any requirements of the NERC. PG&E is a member of the WSCC and is required to meet WSCC Regional Reliability and NERC standards in addition to internal and ISO requirements.

Automatic: Self-acting, operated by its own mechanism when actuated by some impersonal influence as, for example, a change in current strength; not manual; without personal intervention.

Automatic Control: An arrangement of electrical controls which provide for opening and/or closing in an automatic sequence and under predetermined conditions; the switches which then maintain the required character of service and provide adequate protection against all usual operating emergencies.

Automatic Reclosing: A feature of some circuit breakers which allows them to reclose automatically after being tripped under abnormal conditions.

Automatic Tripping (Automatic Opening): The opening of a circuit breaker under predetermined conditions without the intervention of an operator.

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B

Balanced Load: An equal distribution of load on all phases of an alternating current circuit.

Boost: To increase voltage.

Bundled Service, or Bundled Utility Service: Traditional PG&E service: transmission and distribution capacity for delivery, energy and ancillary services

Breaker: A switch which can open a circuit, usually designed for automatic operation.

- * Defined Term. For interpretive purposes, these words are capitalized in the body of this Handbook



C

Capacitance: Capacitance is developed when two charged or energized conductors are separated by a dielectric. An excess or deficiency of electrons is maintained on opposite plates of a charged capacitor. It may be said to be the property of an electrical circuit which opposes any change of voltage.

Capacity: The number of amperes of electric current a wire will carry without becoming unduly heated; the capacity of a machine, apparatus, or devices is the maximum of which it is capable under existing service conditions; the load for which a generator, turbine, transformer, transmission circuit, apparatus, station, or system is rated. Capacity is also used synonymously with capability.

Capacity Factor: The ratio of average load on a generating resource to its capacity rating during a specified period of time, expressed in percentages.

Circuit: A conducting part through which an electric current is intended to flow.

Circuit Breaker: A device for interrupting a circuit between separable contacts under normal or fault conditions.

Circuit Switcher: A device for interrupting a circuit between separable contacts under normal or fault conditions.

- * **Class A Telephone Circuit:** Service performance objective classification for a circuit which is non-interruptible before, during and after a power fault condition.
- * **Class B Telephone Circuit:** Service performance objective classification for a circuit which is non-interruptible before and after a power fault condition exists.
- * **Clearance:** Permission to contact or to come in close proximity to, wires, conductors, switches, or other equipment which normally might be energized at electrical, hydraulic, or pneumatic potential dangerous to human life. Conditions which must prevail before such permission can be granted are, in general, that the equipment or lines be completely isolated from all possible power sources and be tagged with properly filled out man-on-line tags.

Cogeneration: The sequential production of electricity and heat, steam, or useful work from the same fuel source.

Conductor: Material that can be used as a carrier of an electric current.

Control, Supervisory: A system for selecting control and automatic indication of remotely located units by electrical means, over a relatively small number of common transmission channels.

Control Switch: A switch controlling the circuit through circuit breakers or other switches which are magnetically operated.

CPUC: [California Public Utilities Commission](#).

Current: The part of a fluid (air, water, etc.) flowing in a certain direction. A flow of electric charge measured in amperes.

Current Transformer (CT): A transformer, intended for metering, protective or control purposes, which is designed to have its primary winding connected in series with a circuit carrying the current to be measured or controlled. A current transformer normally steps down

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current values to safer levels. A CT secondary circuit must never be open circuited while energized.

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D

Data Processing Gateway (DPG): ISO specified interface between generator plant systems and ISO and PG&E EMS.

Dead-End Structure: The structure on which the last span of PG&E-owned conductors terminates. Also called a landing structure. From the interconnection requester's point of view, it is sometimes called the take-off structure.

Delta Connected Circuit: A three-phase circuit with three source windings connected in a closed delta (triangle). A closed delta is a connection in which each winding terminal is connected to the end (terminal) of another winding.

Demand: The rate at which electric energy is delivered to or by a system; normally expressed in kilowatts, megawatts or kilovolt amperes.

Designated PG&E Electric Control Center: The Electric Control Center that has been assigned operational jurisdiction over a Load or Generation Entity's substation.

Designated PG&E Switching Center: The PG&E Electric Control Center.

Direct Access: Service election allows customers to purchase electric power and, at the customer's election, additional related services from non-utility entities known as ESPs.

Direct Current (DC): A uni-directional current in which the changes in value are either zero or so small that they may be neglected. (As ordinarily used, the term designates a practically non-pulsating current, such as the output of an electric battery.)

Disconnect: (*noun*) A device used to isolate a piece of equipment. A disconnect may be gang operated (three operated together) or individually operated.

Dispatchability: Ability and availability of a generating facility to operate so that a utility can call upon it to increase or decrease deliveries of capacity to any level up to contract capacity.

Distribution System: The portion of PG&E's Power System that is at a voltage less than 60 kV. The Distribution System continues to be controlled by PG&E.

- * **Distribution Switching Center:** Now termed an Electric Control Center - Distribution
- * **Disturbance:** Trouble (e.g. fault, sudden loss of load or generation, breaker operations, etc.) on the PG&E Power System resulting in abnormal performance of the system. See also System Emergency

Droop: The slope of the prime mover's speed-power characteristic curve. The speed droop, typically 5 percent, enables interconnected generators to operate in parallel with stable load division.

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Electric Circuit: A path or group of interconnected paths capable of carrying electric current.

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Electric Control Center - Distribution: (Formerly Distribution Switching Center or DO): This center directs, coordinates, and implements routine and emergency switching activities on the PG&E distribution system within its geographical jurisdiction in a safe and efficient manner.

Electric Control Center – Transmission (Formerly Transmission Switching Center): This center implements switching operations on the PG&E transmission system within a specific geographical area. The core function of each Transmission Switching Center is to implement switching orders from the ISO and to coordinate routine and emergency switching activities within its geographic jurisdiction in a safe and efficient manner.

Electric Generator: See Generator

Electric Substation: An assemblage of equipment for purposes other than generation or utilization, through which bulk electric energy is passed for the purpose of switching or modifying its characteristics. Service equipment, distribution transformer installations and transmission equipment are not classified as substations.

EMS: Energy Management System. A computer-based system that manages the realtime dispatch of electric resources to meet realtime.

- * **End-Use Customer or End-User:** A purchaser of electric power who purchases such power to satisfy a Load directly connected to the ISO Controlled Grid or to a Distribution System and who does not resell the power.
- * **Energize:** To apply voltage to a circuit or piece of equipment; to connect a de-energized circuit or piece of equipment to a source of electric energy.
- * **ESP ([Energy Service Provider](#)):** Non-utility entities providing services as defined under CPUC [Rule 1](#).

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Fault Indicator: A device attached to lines that targets when the current through the line exceeds the device setting.

Feeder: A circuit having as its primary purpose the distribution of electric energy.

- * **FERC:** [Federal Energy Regulatory Commission](#) or its successor.

Firm Capacity: Power committed to be available at all times during the period covered, except for forced outages and scheduled maintenance.

Forced Outage: Any unplanned outage resulting from a design defect, inadequate construction, operator error or a breakdown of the mechanical or electrical equipment that fully or partially curtails the delivery of electricity between a Load or Generation Entity's facility and PG&E's Power System.

Frequency: The number of cycles occurring in a given interval of time (usually one second) in an electric current. Frequency is commonly expressed in Hertz (Hz); one Hz equals one cycle per second.

Fuse: A short piece of conducting material of low melting point which is inserted in a circuit and will melt and open the circuit when the current reaches a certain value.

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G

Generation Entity: An entity interconnected to PG&E's Power System who has generation facilities (including back-up generation in parallel) on its side of the point of interconnection with PG&E's Power System.

Generation Facility: A plant in which electric energy is produced from some other form of energy by means of suitable converting apparatus. The term "generation facility" includes the generation apparatus and all associated equipment owned, maintained and operated by the Generation Entity.

Generator: The physical electrical equipment that produces electric power. Sometimes used as a brief reference to a Generation Entity.

Generator Interconnection Agreement: An interconnection agreement between PG&E and wholesale Generators connected to the PG&E Power System.

Generator Operating Agreement: An agreement that establishes operating responsibilities and associated procedures for communications between a Generator and PG&E system operators

- * **Green Book:** The Electric and Gas Service Requirements Book ("The Green Book") is a guide to PG&E requirements and policies for establishing electric and gas service to new or remodeled retail customer installations.
- * **Grid Critical Protective Systems:** Protective relay systems and Remedial Action Schemes that the ISO determines may have a direct impact on the ability of the ISO to maintain system security.

Ground: A term used to refer to the earth as a conductor or as the zero of potential. For safety purposes, circuits are grounded while any work is being done on or near a circuit or piece of equipment in the circuit; this is usually called protective grounding.

Ground Bank: A secondary transformer bank installed on delta connected winding to provide a path to ground for relaying purposes.

Ground Fault: An unintentional electric current flow between one or more energized conductors and the ground.

Ground Potential Rise: A calculated value of the highest expected voltage due to a line-to-ground fault at or near the station (power switchyard). The value is calculated as follows:

$$\text{GPR} = 1.2 \text{ (DC Transient Factor)} \times 1.4 \times \text{Ground Fault Return Current (rms)} \\ \times \text{Ground Resistance}$$

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H

Handbook: The PG&E Interconnection Handbook as it may be modified from time to time.

Hertz (Hz): The term denoting cycles per second or frequency.

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I

IEEE ([The Institute of Electrical and Electronics Engineers](#)): Among other things, the IEEE develops technical standards applicable to the electric industry including relays, transformers, and metering.

Inductance: The property of an electric circuit which produces a voltage by electromagnetic induction when the current in the circuit changes or varies. It opposes any change of circuit current.

Induction Generator: Typically, an induction motor that is being driven by a prime mover at a speed which is faster than the synchronous mechanical speed to generate electric power. It typically depends on the host system for its excitation and speed regulation.

Interconnection Facilities: All means required and apparatus installed to interconnect and deliver power from a Load or Generation Entity facility to the PG&E Power System including, but not limited to, connection, transformation, switching, metering, communications, and safety equipment, such as equipment required to protect (1) the PG&E Power System and Load or Generation Entities from faults occurring at the Load or Generation and (2) the Load or Generation facility from faults occurring on the PG&E Power System or on the systems of others to which the PG&E Power System is directly or indirectly connected. Interconnected facilities also include any necessary additions and reinforcements by PG&E to its system required as a result of the interconnection of a facility to the PG&E Power System.

Interconnection Study: Those studies performed in conjunction with an interconnection request to determine the facilities needed to interconnect the Load or Generation Entity in accordance with Applicable Reliability Requirements.

Interrupting Capacity: The amount of current a switch or circuit breaker can safely interrupt.

Interruption: A temporary discontinuance of the supply of electrical power.

IOU: Investor-owned utility. In California the three IOUs are PG&E, SCE, and SDG&E.

- * **ISO** ([Independent System Operator](#)): The California Independent System Operator Corporation, a state chartered, nonprofit corporation that controls the transmission facilities of all Participating TOs and dispatches certain Generating Units and Loads.
- * **ISO Controlled Grid:** The system of transmission lines and associated facilities of the Participating TOs that have been placed under the ISO's Operational Control.
- * **ISO Metered Entity:** Entities directly connected to the ISO Grid, including, i) certain Generators, ii) Eligible Customers, or iii) certain End Users. ISO Metered Entity also includes any Participating Generator and any Participating TO having Tie Point Meters with other TOs or Control Areas. Refer to complete definition in the Meter Service Agreement.
- * **ISO Protocols:** The rules, protocols, procedures and standards promulgated by the ISO (as amended from time to time) to be complied with by the ISO Scheduling Coordinators, Participating TOs and all other Market Participants in relation to the operation of the ISO Controlled Grid and the participation in the markets for Energy and Ancillary Services in accordance with the ISO Tariff.
- * **ISO Registry:** The register of all the transmission lines, associated facilities and other necessary components that are at the relevant time being subject to the ISO's Operational Control.

* Defined Term. For interpretive purposes, these words are capitalized in the body of this Handbook



- * **ISO Tariff:** The California Independent System Operator Agreement and Tariff, dated March 31, 1997, as it may be modified from time to time. The current version of the ISO Tariff is available on the ISO [website](#).

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K

Kilovolt (kV): 1,000 volts.

Kilovolt-Ampere: (kVa) The product of kilovolts times amperes. Used to refer to high voltage alternating current systems.

Kilowatt (kW): An electrical unit of power which equals 1,000 watts.

Kilowatthour (kWh): 1,000 watts of energy supplied for 1 hour. A basic unit of electric energy equal to the use of 1 kilowatt for a period of 1 hour.

kV: Abbreviation for kilovolt.

kVa: Abbreviation for kilovolt-ampere. For three-phase circuits, it is found by multiplying line-to-line kV times amps times 1.73.

kVar: Abbreviation for kilovolt-ampere-reactive. A measure of reactive power which is required to regulate system voltage.

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Lagging Power Factor: Occurs when reactive power flows in the same direction as real power. Stated with respect to the generator, lagging power factor occurs when the generator is producing Vars.

Leading Power Factor: Occurs when reactive power flows in the opposite direction to real power. Stated with respect to the generator, leading power factor occurs when the generator is absorbing Vars.

Line Losses: Electrical energy converted to heat in the resistance of all transmission and/or distribution lines and other electrical equipment, such as transformers, on the system.

Load Entity, OR Load-only Entity: An entity interconnected to PG&E's Power System at a transmission or distribution voltage level who does not have generation of its own in parallel with PG&E's Power System, and is not interconnected with any source of generation other than PG&E's.

Local Reliability Criteria: Reliability criteria established at the ISO Operations Date, unique to the transmission systems of each of the Participating TOs.

Log: A computer file, a book or loose-leaf sheets for recording all station operations, clearances, readings, ratio reports, and other pertinent active daily data.

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M

Maximum Torque Angle (MTA): The phase angle between the relay measured quantities at which the relay is the most sensitive.

Meter Data Management Agent (MDMA): The entity which is providing MDMA Services for a particular service account.

Metering Services: Consist of removal, ensuring meter design specifications, installation, calibration, and ongoing testing and maintenance of meters.

- * **MDMA Services:** MDMA Services consist of reading the raw data from Interval Meters, validating the data, editing and estimating the data to 'settlement quality' form, placing the settlement quality data on the MDMA Server and, if necessary, usage adjustment.

MSA (Meter Service Agreement): An agreement between the ISO and either a Scheduling Coordinator or a Load Entity.

MSP (Meter Service Provider): The entity which is providing Metering Services for a particular account.

Megawatt (MW): 1 million watts.

Megger: An ohm meter device used to measure the ability of insulation to withstand voltage, as well as measuring the insulation resistance. For example a poor megger test would mean that the insulation is breaking down.

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N

Nameplate Rating (Facility): Output rating information appearing on a generator nameplate, or other electrical device, in accordance with applicable industry standards.

- * **NERC:** The [North American Electric Reliability Council](#) or its successor.

NETA The [International Electric Testing Association](#).

Net Energy Output: The generation facility's gross output in kilowatt-hours less station use to the point of delivery into the PG&E Power System.

Net Sale: The generation facility's gross output, in kW and kWh, less station use to the point of delivery into the PG&E Power System.

Neutral: The common point of a star-connected transformer bank, a point which normally is at zero potential with reference to the earth.

No Sale: The Generation Entity desires to operate in parallel and not sell power to PG&E.

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O

Ohm: The unit of resistance of an electric circuit.

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One-Line Diagram: A diagram in which several conductors are represented by a single line and various devices or pieces of equipment are denoted by simplified symbols. The purpose of such a diagram is to present an electrical circuit in a simple way so that its function and configuration can be readily grasped.

- * **Operating Procedures:** Procedures governing the operation of the ISO Controlled Grid as the ISO may from time to time develop, and/or procedures that Participating TOs currently employ which the ISO adopts for use.
- * **Operational Control:** The rights of the ISO under the Transmission Control Agreement and the ISO Tariff to direct Participating TOs how to operate their transmission lines and facilities and other electric plant affecting the reliability of those lines and facilities for the purpose of affording comparable non-discriminatory transmission access and meeting Applicable Reliability Criteria.

Outage: A condition existing when a line or a substation is de-energized.

Output: The energy delivered by a generation facility during its operation.

Overload: A load in amperes greater than an electric device or circuit is designed to carry.

Overvoltage: Voltage higher than that desired or higher than that for which the equipment in question is designed.

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P

Parallel: (*Verb*) To connect electrically a generator or energized source, operating at an acceptable frequency and voltage, with an adjacent generator or energized system, after matching frequency, voltage and phase angle.

Parallel Operation: As used in this manual, the operation of a non-utility-owned generator while connected to the utility's grid. Parallel operation may be required solely for the power producer's operating convenience, or for the purpose of delivering power to the utility's grid.

- * **Participating Generator:** A Generator selling power to the market palce. Such generators must use the services of a Scheduling Coordinator and must be bound by the terms of the Participating Generator Agreement. Participating Generators may be interconnected to either the transmission or distribution system.
- * **Participating Generator Agreement:** An agreement between a Generator and the ISO that specifies certain requirements and protocols for Participating Generators. The current version of the Participating Generator Agreement may be found the ISO's [website](#).
- * **Participating TO:** A party to the [TCA](#) whose application under Section 2.2 of the TCA has been accepted and who has placed its transmission assets and Entitlements under the ISO's Operational Control in accordance with the TCA.

Peaking: Operation of generating facilities to meet maximum instantaneous electrical demands.

Permissive Overreach Transfer Trip Scheme (POTT): A very secure line protection scheme for insuring that a fault is within the protected line section. It requires the presence of both a trip signal from a remote terminal and a trip signal from the local relay before tripping the local breaker.

- * **PG&E Power System:** The electric transmission and distribution wires, and their related facilities owned by PG&E, including PG&E's portion of the ISO Controlled Grid
- * **Defined Term.** For interpretive purposes, these words are capitalized in the body of this Handbook



Point of Interconnection: The point where the Load or Generation Entities' facilities connect with facilities owned by PG&E (point of ownership change).

PT (Potential Transformer): A transformer which is intended to reproduce in its secondary circuit, in a known proportion, the voltage of the primary circuit. Also known as Voltage Transformer

Power: The time rate of transferring or transforming energy.

Power Factor: The ratio of real (MW) power to apparent power (MVA). Power factor is the cosine of the phase angle difference between the current and voltage of a given phase.

Primary: Normally considered as the high-voltage winding of a substation or distribution transformer; any voltage used for transmission of electric power in reasonably good-sized blocks and for some distance, as contrasted with low voltage for the immediate supply of power and light locally such as the distribution within a building. The lowest voltage considered as a primary voltage is 2.4 kV although this is also used for some heavy power requirements as short distances. Primary is commonly referred to as 2.4 kV, 4 kV, 17 kV, and 21 kV.

Primary Distribution System: A system of alternating current distribution for supplying the primaries of distribution transformers from the generating station or distribution substation.

Protection: All of the relays and other equipment which are used to open the necessary circuit breakers to clear lines or equipment when trouble develops.

Protective Relay: A device whose function is to detect defective lines or apparatus, or other power-system conditions of an abnormal or dangerous nature and to initiate appropriate control circuit action.

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Q

Qualifying Facility (QF): As defined in the Public Utility Regulatory Policies Act of 1978 (PURPA), a QF is a small-power producer or cogenerator that can sell its electricity to public utilities. QFs selling power to PG&E do so under three CPUC-jurisdictional standard contracts: Standard Offer 4, Standard Offer 2, and Standard Offer 1. See the [Qualifying Facilities Information Center](#) for more information.

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R

Reactance: In an alternating current circuit, the opposition to the flow of current attributable to the inductance and capacitance of the circuit.

Reactive Component of Current: That part of a current that does no useful work because its phase is 90 degrees leading or lagging the voltage.

Reactive Load: In alternating current work, a load whose current is not in phase with the voltage across the load.

Reactor: A coil with no secondary winding provided. The primary use is to introduce inductance into the circuit for purposes such as starting motors, paralleling transformers and controlling current. A current-limiting reactor is a reactor for limiting the current that can flow in a circuit under short-circuit conditions.

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Reclose: To again close a circuit breaker after it has opened by relay action.

- * **RAS (Remedial Action Scheme):** Protective systems that typically utilize a combination of conventional protective relays, computer-based processors, and telecommunications to accomplish rapid, automated response to unplanned power system events. Also, details of RAS logic and any special requirements for arming of RAS schemes, or changes in RAS programming, that may be required.

Remote Intelligent Gateway (RIG): Specific type of ISO specified Data Processing Gateway (DPG).

Remote Station Alarms: Alarms received at an attended location from unattended stations or plants.

Remote Terminal Unit (RTU): A remotely located equipment used for collecting data and/or for supervisory control via communication channel.

Residual Current: The current which flows in the neutral or star (wye) connected current transformers when the current in the three phases of a line are unbalanced.

Resistance: Anything placed in an electric circuit, or already there, which offers resistance to or opposes the flow of electric current.

Resistor: A device whose primary purpose is to introduce resistance into an electric circuit. An adjustable resistor is one so constructed that its amount of resistance can be readily changed.

Retail Service: Electric sales to PG&E's end-use or retail customers. Such service is regulated by the CPUC.

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S

- * **SC (Scheduling Coordinator):** An entity certified by the ISO for the purposes of undertaking the functions specified in Section 2.2.6 of the ISO Tariff.

SCADA: Supervisory Control and Data Acquisition. SCADA is the combination of telemetry and data acquisition and consists of collecting information, transferring it back to a central site, carrying out necessary analysis and control, and then displaying this data on a number of operator screens. SCADA is used to monitor and control a plant, a substation, or other utility installations.

SCE: [Southern California Edison Company](#)

SC Metered Entity: Refer to ISO Metered Entity

Schematic: A diagram showing the essential features of a piece of equipment or a control system.

SDG&E: [San Diego Gas & Electric Company](#)

Secondary: The winding of a transformer which is normally operated at a lower voltage than the primary winding.

Secondary Distribution System: A low-voltage alternating-current system which connects the secondaries of distribution transformers to the consumer's services.

Self-excited: A term to describe an electric machine in which the field current is secured from its own armature current. In the case of induction generators, it refers to the condition in which the

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induction generator is separated from its normal excitation source and is unintentionally excited by the power-factor correction capacitors in the vicinity.

Separately Excited: Use of an exciter for sending current through the field windings of an electric machine in place of taking the field current from its own armature current.

Service Reliability: The time an entity or group of entities is served compared to the amount of time the entity or entities are without service over a given time period.

Service Restoration: The switching procedure a system operator directs or executes to restore services to the entities following an outage.

Setting: The values of current, voltage, or time at which a relay is adjusted.

Single-Phase Circuit: A circuit in which all current can be represented by only one regular sine wave pattern. Differs from a three-phase circuit, where when all circuit current is plotted, it produces three regular sign wave patterns, 120 electrical degrees apart.

* **Special Facilities:** Those additions and reinforcements to the PG&E Power System which are needed to accommodate the receipt and/or delivery of energy and capacity from and/or to the entity's facility(ies), and those parts of the interconnection facilities which are owned and maintained by PG&E at the entity's request, including metering and data processing equipment.

Standard Offer Contract: A CPUC-jurisdictional contract under which a Qualifying Facility sells power to PG&E.

Standby Capacity: The lesser of (1) net generation capacity, (2) connected loads to generator, or (3) 80 percent of main switch rating.

Star-Connected Circuit ("Y" Connected Circuit): A term applied to the manner in which a motor's windings or a transformer's windings are connected, i.e., star-connected armature having one end of each of the coils connected to a common junction. A star-connected transformer is one in which the primaries and secondaries are connected in a star grouping.

Station Use: Energy used to operate the generating facility's auxiliary equipment. (Auxiliary equipment includes, but is not limited to, forced and induced draft fans, cooling towers, boiler feed pumps, lubricating oil systems, power plant lighting, fuel handling systems, control systems, and sump pumps.)

Step-Down Transformer: A transformer in which the secondary winding has fewer turns than the primary, so that the secondary delivers a lower voltage than is supplied to the primary.

Step-Up Transformer: A transformer in which the secondary winding has more turns than the primary, so that the secondary delivers a higher voltage than is applied to the primary.

Supervisory Control: A system by which equipment is operated by remote control at a distance using some type of code transmitted by wire or electronic means.

Surplus Sale: The generator's gross output, in kW and kWh, less any plant load and transformation and transmission losses, is delivered to the PG&E system.

Switch: A device for making, breaking or changing the connections in an electric circuit.

Switch, Air: A switch in which the arc interruption of the circuit occurs in the air.

Switch, Alarm: A form of auxiliary switch which closes the circuit to a bell or other audible signaling device upon automatic opening of the circuit breaker or other apparatus with which it is associated.

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Switch, Auxiliary: One actuated by some main device such as a circuit breaker for signaling, interlocking, or other purpose.

Synchronism: Expresses the condition across an open circuit wherein the voltage sine wave on one side matches the voltage sine wave on the other side in frequency and without phase angle difference.

System: The entire generating, transmitting and distributing facilities of an electric utility.

- * **System Emergency:** Conditions beyond the normal control of the ISO that affect the ability of the ISO Control Area to function normally including any abnormal system condition which requires immediate manual or automatic action to prevent loss of Load, equipment damage, or tripping of system elements which might result in cascading outages or to restore system operation to meet the minimum operating reliability criteria.

System Protection Facilities: All equipment required to protect (1) the PG&E Power System from faults occurring at a Load or Generation Entities' facility and (2) the Load or Generation Entities' facility from faults occurring on the PG&E Power System or on the system of others to which it is directly or indirectly connected.

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T

- * **TCA (Transmission Control Agreement):** The [agreement](#) (with [Appendix A](#)) between the ISO and Participating TOs establishing the terms and conditions under which TOs will become Participating TOs and how the ISO and each Participating TO will discharge their respective duties and responsibilities, as may be modified from time to time.

Telephone Working Limit: A voltage potential of 300 volts or less is present, so personnel can work on the telephone cable without rubber gloves.

Telemetry: Remote measurement of a physical value or status (i.e. generator kV, status of a switch, etc.) by means of a communication channel. Telemetry of kW, kVar, etc to PG&E's Electric Energy Control Center in San Francisco and the ISO is required for all generators equal to or greater than 10 MVA.

TO (transmission owner): An entity owning transmission facilities or having firm contractual rights to use transmission facilities.

TO Tariffs: A tariff setting out a Participating TO's rates and charges for transmission access to the ISO Controlled Grid and whose other terms and conditions are the same as those contained in the document referred to as the Transmission Owners Tariff approved by FERC as it may be amended from time to time. PG&E's TO Tariff can be viewed [here](#).

- * **TOC (Transmission Operations Center):** This center serves as PG&E's interface to the ISO on day to day operational matters. The ISO issues operational orders to the TOC which will then process, coordinate, and redirect the orders to the appropriate PG&E Transmission Switching Center as needed.

T T (Transfer Trip): A form of remote trip in which a communication channel is used to transmit the trip signal from the relay location to a remote location.

Transformer: An electric device, without continuously moving parts, in which electromagnetic induction transforms electric energy from one or more other circuits at the same frequency, usually with changes in value of voltage and current.

- * Defined Term. For interpretive purposes, these words are capitalized in the body of this Handbook



Transformer Efficiency: The ratio of the electric power of the current going into a transformer to the power of the secondary circuit from the transformer.

Transformer Loss: The difference between the input power to a transformer and the output power of the transformer.

Transformer Ratio: The ratio of the voltage secured from a transformer to the voltage supplied to that transformer.

Transmission Line: A line used for electric power transmission. Distinguished from a distribution line by voltage. Lines rated 60 kV and over are transmission lines.

Transmission System: The portion of PG&E's Power System that is at a voltage of 60 kV and above. The Transmission System is under the operational control of the ISO.

Transmission Switching Center: Now termed Electric Control Center – Transmission.

[\[top\]](#)

U

UDC (Utility Distribution Company): An entity that owns a Distribution System for the delivery of Energy to and from the ISO Controlled Grid, and that provides regulated retail electric service to Eligible Customers, as well as regulated procurement service to those End-Use Customers who are not yet eligible for direct access, or who choose not to arrange services through another retailer.

PG&E's UDC System: Refers to those components of the PG&E Power System which are not a part of the ISO Controlled Grid.

Undervoltage Protection: Upon failure or reduction of voltage, the protection device interrupts power to the main circuit and maintains the interruption.

Undervoltage Release: Upon failure or reduction of voltage, the protective device interrupts power to the main circuit but does not prevent again completing the main circuit upon return to voltage.

Unity Power Factor: A power factor of 1.000 which exists in a circuit wherein the voltage and current are in phase.

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V

Var: A unit of measurement of reactive power. It is an expression of the difference between current and voltage sine waves in a given circuit.

$$VA^2 = (\text{Watts})^2 + (\text{Vars})^2$$

Volt: The unit of electrical pressure similar to the pounds per square inch pressure on a steam gauge.

Volt-Ampere: A unit of apparent power in an alternating-current circuit. Equal to the product of volts and amperes without reference to the phase difference, if any. At unity power factor, a volt-ampere equals a watt. Whenever there is any phase difference between voltage and current, the true power in watts is less than the apparent power in volt-amperes.

* Defined Term. For interpretive purposes, these words are capitalized in the body of this Handbook



Voltage Drop: The difference in voltage level between one point and another in a circuit (see Line Voltage Drop).

Voltage Loss: The drop of potential in an electric circuit due to the resistance and reactance of the conductor. This loss exists in every circuit.

Voltage Ratio of Transformer: The ratio of the effective primary voltage to the effective secondary voltage of a transformer.

Voltage Transformer: See PT

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W

* **WEnet (Western Energy Network):** An electronic network that facilitates communications and data exchange among the ISO, Market Participants and the public in relation to the status and operation of the ISO Controlled Grid.

* **WSCC ([Western Systems Coordinating Council](#)):** The Western Systems Coordinating Council or its successor.

Watt: The unit of electric power. Watts AC = volts x amperes x power factor (single-phase circuits).

Watt-Hour: A measure of electric power. The power of 1 watt used for 1 hour.

Watt-Hour Meter: An electrical measuring instrument which indicates power in watt-hours.

Wheeling Out: Except for Existing Rights and Non-Converted Rights exercised under an Existing Contract in accordance with Sections 2.4.3 and 2.4.4, the use of the ISO Controlled Grid for the transmission of Energy from a Generating Unit located within the ISO Controlled Grid to serve a Load located outside the transmission and distribution system of a Participating TO.

Wheeling Through: Except for Existing Rights and Non-Converted Rights exercised under an Existing Contract in accordance with Sections 2.4.3 and 2.4.4, the use of the ISO Controlled Grid for the transmission of Energy from a Generating Unit located outside the ISO Controlled Grid to serve a Load located outside the transmission and distribution system of a Participating TO.

Wholesale Customer: A person wishing to purchase Energy and Ancillary Services at a Bulk Supply Point or a Scheduling Point for resale.

[Wholesale Distribution Tariff:](#) A tariff executed by wholesale Load or Generation Entities connected to PG&E's Distribution System.

Wholesale Sales: The sale of Energy and Ancillary Services at a Bulk Supply Point or a Scheduling Point for resale.

Wholesale Service: Electric Sales to Wholesale Customers for resale. Such service is regulated by the FERC.

"Wye" Connected Circuit: A three-phase circuit which is star-connected: the windings of all three phases have one common connection which may be connected to ground

* Defined Term. For interpretive purposes, these words are capitalized in the body of this Handbook