

Appendix E. Glossary

Area control error (ACE): The instantaneous difference between net actual and scheduled interchange, taking into account the effects of frequency deviations.

Balancing area (balancing authority area): The collection of generation, transmission, and loads within the metered boundaries of the balancing authority. The balancing authority maintains load-resource balance within this area.

Before-and-after control impact (BACI): A schematic method used to trace environmental effects from substantial anthropogenic changes to the environment. The overall aim of the method is to estimate the state of the environment before and after any change and the specific objectives is to compare changes at reference sites (or control sites) with the actual area of impact.

Bus: An electrical conductor that serves as a common connection for two or more electrical circuits.

Bus-bar: The point at which power is available for transmission.

Cap and trade: An established policy tool that creates a marketplace for emissions. Under a cap and trade program, the government regulates the aggregate amount of a type of emissions by setting a ceiling or cap. Participants in the program receive allocated allowances that represent a certain amount of pollutant and must purchase allowances from other businesses to emit more than their given allotment.

Capability: The maximum load that a generating unit, generating station, or other electrical apparatus can carry under specified conditions for a given period of time without exceeding approved limits of temperature and stress.

Capacity: The amount of electrical power delivered or required for which manufacturers rate a generator, turbine, transformer, transmission circuit, station, or system.

Capacity factor (CF): A measure of the productivity of a power plant, calculated as the amount of energy that the power plant produces over a set time period, divided by the amount of energy that would have been produced if the plant had been running at full capacity during that same time interval. Most wind power plants operate at a capacity factor of 25% to 40%.

Capacity penetration: The ratio of the nameplate rating of the wind plant capacity to the peak load. For example, if a 300-megawatt (MW) wind plant is operating in a zone with a 1,000 MW peak load, the capacity penetration is 30%. The capacity penetration is related to the energy penetration by the ratio of the system load factor to the wind plant capacity factor. For example, say that the system load factor is 60% and the wind plant capacity factor is 40%. In this case, and with an energy penetration of 20%, the capacity penetration would be $20\% \times 0.6/0.4$, or 30%.

Capital costs: The total investment cost for a power plant, including auxiliary costs.

Carbon dioxide (CO₂): A colorless, odorless, noncombustible gas present in the atmosphere. It is formed by the combustion of carbon and carbon compounds (such as fossil fuels and biomass); by respiration, which is a slow form of combustion in animals and plants; and by the gradual oxidation of organic matter in the soil. CO₂ is a greenhouse gas that contributes to global climate change.

Carbon monoxide (CO): A colorless, odorless, but poisonous combustible gas. Carbon monoxide is produced during the incomplete combustion of carbon and carbon compounds, such as the fossil fuels coal and petroleum.

Circuit: An interconnected system of devices through which electrical current can flow in a closed loop.

Competitive Renewable Energy Zones (CREZ): A mechanism of the renewable portfolio standard in Texas designed to ensure that the electricity grid is extended to prime wind energy areas. The designation of these areas directs the Electric Reliability Council of Texas to develop plans for transmission lines to these areas that will connect them with the grid. See also “Electric Reliability Council of Texas” and “renewable portfolio standard.”

Conductor: The material through which electricity is transmitted, such as an electrical wire.

Conventional fuel: Coal, oil, and natural gas (fossil fuels); also nuclear fuel.

Cycle: In AC electricity, the current flows in one direction from zero to a maximum voltage, then back down to zero, then to a maximum voltage in the opposite direction. This comprises one cycle. The number of complete cycles per second determines the frequency of the current. The standard frequency for AC electricity in the United States is 60 cycles.

Dispatch: The physical inclusion of a generator’s output onto the transmission grid by an authorized scheduling utility.

Distribution: The process of distributing electricity. Distribution usually refers to the series of power poles, wires, and transformers that run between a high-voltage transmission substation and a customer’s point of connection.

Effective load-carrying capability (ELCC): The amount of additional load that can be served at the target reliability level by adding a given amount of generation. For example, if adding 100 MW of wind could meet an increase of 20 MW of system load at the target reliability level, the turbine would have an ELCC of 20 MW, or a capacity value of 20% of its nameplate value.

Electricity generation: The process of producing electricity by transforming other forms or sources of energy into electrical energy. Electricity is measured in kilowatt-hours.

Electric Reliability Council of Texas (ERCOT): One of the 10 regional reliability councils of the North American Electric Reliability Council. ERCOT is a membership-based 501(c)(6) nonprofit corporation, governed by a board of directors and subject to oversight by the Public Utility Commission of Texas and the Texas Legislature. ERCOT manages the flow of electric power to approximately 20 million customers in Texas, representing 85% of the state's electric load and 75% of the Texas land area. See also "North American Electric Reliability Council."

Energy: The capacity for work. Energy can be converted into different forms, but the total amount of energy remains the same.

Energy penetration: The ratio of the amount of energy delivered from one type of resource to the total energy delivered. For example, if 200 megawatt-hours (MWh) of wind energy supplies 1,000 MWh of energy consumed, wind's energy penetration is 20%.

Externality: A consequence that accompanies an economic transaction, where that consequence affects others beyond the immediate economic actors and cannot be limited to those actors.

Feed-in law: A legal obligation on utilities to purchase electricity from renewable sources. Feed-in laws can also dictate the price that renewable facilities receive for their electricity.

Frequency: The number of cycles through which an alternating current passes per second, measured in hertz.

Gearbox: A system of gears in a protective casing used to increase or decrease shaft rotational speed.

Generator: A device for converting mechanical energy to electrical energy.

Gigawatt (GW): A unit of power, which is instantaneous capability, equal to one million kilowatts.

Gigawatt-hour (GWh): A unit or measure of electricity supply or consumption of one million kilowatts over a period of one hour.

Global warming: A term used to describe the increase in average global temperatures caused by the greenhouse effect.

Green power: A popular term for energy produced from renewable energy resources.

Greenhouse effect: The heating effect that results when long-wave radiation from the sun is trapped by greenhouse gases produced by natural and human activities.

Greenhouse gases (GHGs): Gases such as water vapor, CO₂, methane, and low-level ozone that are transparent to solar radiation, but opaque to long-wave radiation. These gases contribute to the greenhouse effect.

Grid: A common term that refers to an electricity transmission and distribution system. See also “power grid” and “utility grid.”

Grid codes: Regulations that govern the performance characteristics of different aspects of the power system, including the behavior of wind plants during steady-state and dynamic conditions. These fundamentally technical documents contain the rules governing the operations, maintenance, and development of the transmission system and the coordination of the actions of all users of the transmission system.

Heat rate: A measure of the thermal efficiency of a generating station. Commonly stated as British thermal units (Btu) per kilowatt-hour. *Note:* Heat rates can be expressed as either gross or net heat rates, depending whether the electricity output is gross or net generation. Heat rates are typically expressed as net heat rates.

Instantaneous penetration: The ratio of the wind plant output to load at a specific point in time, or over a short period of time.

Investment tax credit (ITC): A tax credit that can be applied for the purchase of equipment such as renewable energy systems.

Kilowatt (kW): A standard unit of electrical power, which is instantaneous capability equal to 1,000 watts.

Kilowatt-hour (kWh): A unit or measure of electricity supply or consumption of 1,000 watts over a period of one hour.

Leading edge: The surface part of a wind turbine blade that first comes into contact with the wind.

Lift: The force that pulls a wind turbine blade.

Load (electricity): The amount of electrical power delivered or required at any specific point or points on a system. The requirement originates at the consumer’s energy-consuming equipment.

Load factor: The ratio of the average load to peak load during a specified time interval.

Load following: A utility’s practice in which more generation is added to available energy supplies to meet moment-to-moment demand in the utility’s distribution system, or in which generating facilities are kept informed of load requirements. The goal of the practice is to ensure that generators are producing neither too little nor too much energy to supply the utility’s customers.

Megawatt (MW): The standard measure of electricity power plant generating capacity. One megawatt is equal to 1,000 kilowatts or 1 million watts.

Megawatt-hour (MWh): A unit of energy or work equal to 1,000 kilowatt-hours or 1 million watt-hours.

Met tower: A meteorological tower erected to verify the wind resource found within a certain area of land.

Modified Accelerated Cost Recovery System (MACRS): A U.S. federal system through which businesses can recover investments in certain property through depreciation deductions over an abbreviated asset lifetime. For solar, wind, and geothermal property placed in service after 1986, the current MACRS property class is five years. With the passage of the Energy Policy Act of 2005, fuel cells, microturbines, and solar hybrid lighting technologies became classified as five-year property as well.

Nacelle: The cover for the gearbox, drivetrain, and generator of a wind turbine.

Nameplate rating: The maximum continuous output or consumption in MW of an item of equipment as specified by the manufacturer.

Nondispatchable: The timing and level of power plant output generally cannot be closely controlled by the power system operator. Other factors beyond human control, such as weather variations, play a strong role in determining plant output.

Nitrogen oxides (NO_x): The products of all combustion processes formed by the combination of nitrogen and oxygen. NO_x and sulfur dioxide (SO₂) are the two primary causes of acid rain.

Power: The rate of production or consumption of energy.

Power grid: A common term that refers to an electricity transmission and distribution system. See also “utility grid.”

Power marketers: Business entities engaged in buying and selling electricity. Power marketers do not usually own generating or transmission facilities, but take ownership of the electricity and are involved in interstate trade. These entities file with the Federal Energy Regulatory Commission (FERC) for status as a power marketer.

Power Purchase Agreement (PPA): A long-term agreement to buy power from a company that produces electricity.

Power quality: Stability of frequency and voltage and lack of electrical noise on the power grid.

Public Utility Commission: A governing body that regulates the rates and services of a utility.

Public Utility Regulatory Policies Act (PURPA) of 1978: As part of the National Energy Act, PURPA contains measures designed to encourage the conservation of energy, more efficient use of resources, and equitable rates. These measures included suggested retail rate reforms and new incentives for production of electricity by cogenerators and users of renewable resources.

Production tax credit (PTC): A U.S. federal, per-kilowatt-hour tax credit for electricity generated by qualified energy resources. Originally enacted as part of the Energy Policy Act of 1992, the credit expired at the end of 2001, was extended in March 2002, expired at the end of 2003, was renewed on October 4, 2004 and was then extended through December 31, 2008.

Radioactive waste: Materials remaining after producing electricity from nuclear fuel. Radioactive waste can damage or destroy living organisms if it is not stored safely.

Ramp rate: The rate at which load on a power plant is increased or decreased. The rate of change in output from a power plant.

Renewable energy: Energy derived from resources that are regenerative or that cannot be depleted. Types of renewable energy resources include wind, solar, biomass, geothermal, and moving water.

Regional Greenhouse Gas Initiative (RGGI): An agreement among 10 northeastern and mid-Atlantic states to reduce CO₂ emissions. Through the initiative, the states will develop a regional strategy to control GHGs. Fundamental to the agreement is the implementation of a multistate cap and trade program to induce a market-based emissions controlling mechanism.

Renewable energy credit (REC) or certificate: A mechanism created by a state statute or regulatory action to make it easier to track and trade renewable energy. A single REC represents a tradable credit for each unit of energy produced from qualified renewable energy facilities, thus separating the renewable energy's environmental attributes from its value as a commodity unit of energy. Under a REC regime, each qualified renewable energy producer has two income streams—one from the sale of the energy produced, and one from the sale of the RECs. The RECs can be sold and traded and their owners can legally claim to have purchased renewable energy.

Renewable portfolio standard (RPS): Under such a standard, a certain percentage of a utility's overall or new generating capacity or energy sales must be derived from renewable resources (e.g., 1% of electric sales must be from renewable energy in the year 200x). An RPS most commonly refers to electricity sales measured in megawatt-hours, as opposed to electrical capacity measured in megawatts.

Restructuring: The process of changing the structure of the electric power industry from a regulated guaranteed monopoly to an open competition among power suppliers.

Rotor: The blades and other rotating components of a wind turbine.

Solar energy: Electromagnetic energy transmitted from the sun (solar radiation).

Sulfur dioxide (SO₂): A colorless gas released as a by-product of combusted fossil fuels containing sulfur. The two primary sources of acid rain are SO₂ and NO_x.

Trade wind: The consistent system of prevailing winds occupying most of the tropics. Trade winds, which constitute the major component of the general circulation of the atmosphere, blow northeasterly in the northern hemisphere and southeasterly in the southern hemisphere. The trades, as they are sometimes called, are the most persistent wind system on Earth.

Turbine: A term used for a wind energy conversion device that produces electricity. See also "wind turbine."

Turbulence: A swirling motion of the atmosphere that interrupts the flow of wind.

Utility grid: A common term that refers to an electricity transmission and distribution system. See also “power grid.”

Variable-speed wind turbines: Turbines in which the rotor speed increases and decreases with changing wind speeds. Sophisticated power control systems are required on variable-speed turbines to ensure that their power maintains a constant frequency compatible with the grid.

Volt (V): A unit of electrical force.

Voltage: The amount of electromotive force, measured in volts, between two points.

Watt (W): A unit of power.

Watt-hour (Wh): A unit of electricity consumption of one watt over the period of one hour.

Wind: Moving air. The wind’s movement is caused by the sun’s heat, the earth, and the oceans, which force air to rise and fall in cycles.

Wind energy: Energy generated by using a wind turbine to convert the mechanical energy of the wind into electrical energy. See also “wind power.”

Wind generator: A wind energy conversion system designed to produce electricity.

Wind power: Power generated by using a wind turbine to convert the mechanical power of the wind into electrical power. See also “wind energy.”

Wind power density: A useful way to evaluate the wind resource available at a potential site. The wind power density, measured in watts per square meter, indicates the amount of energy available at the site for conversion by a wind turbine.

Wind power class: A scale for classifying wind power density. There are seven wind power classes, ranging from 1 (lowest wind power density) to 7 (highest wind power density). In general, sites with a wind power class rating of 4 or higher are now preferred for large-scale wind plants.

Wind power plant: A group of wind turbines interconnected to a common utility system.

Wind resource assessment: The process of characterizing the wind resource and its energy potential for a specific site or geographical area.

Wind speed: The rate of flow of wind when it blows undisturbed by obstacles.

Wind speed profile: A profile of how the wind speed changes at different heights above the surface of the ground or water.

Wind turbine: A term used for a device that converts wind energy to electricity.

Wind turbine rated capacity: The amount of power a wind turbine can produce at its rated wind speed.

Windmill: A wind energy conversion system that is used primarily to grind grain. Windmill is commonly used to refer to all types of wind energy conversion systems.