Annex 21 - Glossary

Absorption Neutron - any reaction in which a free neutron is absorbed by a nucleus, including capture and fission.

Accelerator - a device that increases the speed, and hence energy, of particles, usually through forces induced by electromagnetic fields.

Accident - an uncontrolled event which has the potential of creating an emergency condition. Referred to in this Annex as an incident.

Accumulator (PWR) - a storage tank containing water under pressure and available for automatic injection into a PWR during a LOCA.

Actinides - a chemical group of heavy elements, including actinium, thorium, protactinium, uranium, neptunium, americium, and curium.

Alert - events that are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant.

Assessment Actions - actions taken during or after an incident to evaluate the severity, and/or the possible offsite consequences of the incident. Information obtained from assessment action is used to make decisions to implement specific emergency measures.

Auxiliary Building - houses the service equipment necessary for the normal operation of the nuclear plant.

Background Radiation - radiation from natural sources (cosmic rays, rocks, and from minerals inside the body). Normal background radiation for American is about 100 to 200 millirems per year, with the higher figure occurring at higher altitudes.

Blowdown - the rapid emptying of coolant from the primary system during a LOCA.

Boiling Water Reactor - a nuclear reactor in which water is boiled in the core; the resulting steam drives a turbine to generate electricity.

Break-event or (self-sustaining) - in connection with reactor neutronics, the condition with conversion ratio equal to 1, (i.e., where as much fissile material is produced as is destroyed).

Breeding - production of fissile material (usually in excess of that consumed) from fertile material.

Breeding Ratio - the ratio of the number of fissile atoms produced to the number consumed (usually the same kind).

Capacity Factor - ratio of average plant electrical energy output to rated output.

Chain Reaction - a self-sustaining series of events occurring when a neutron splits an atom thereby releasing sufficient neutrons to cause many other atoms to split in the same way.

Chain Reaction, Nuclear - the sequence of reactions in which neutrons, the products of fission reactions, induce subsequent fission reactions.

Cladding - the outer jacket of nuclear fuel rods. It prevents corrosion of the fuel if the temperature of the core coolant has dropped below the boiling point of water.

Cold Shutdown - a reactor condition in which the coolant temperature has been reduced to 200 degrees F or below and the pressure has essentially been reduced to atmospheric pressure.

Condenser - apparatus where steam which turns the turbines is cooled, and condensed to liquid state for return to the steam generator.

Containment Building - houses the reactor, pressurizer, reactor coolant pumps, steam generator, and other equipment or piping containing reactor coolant. The containment building is an airtight structure, which typically is made of steel-reinforced concrete three feet thick.

Control - neutron absorbing mechanisms used for maintenance of the multiplication factor (and hence of the chain reaction) at the desired level; in a more general sense, may refer to any system (including electronic instrumentation) for maintaining operational direction of the power plant.

Control Rod - a rod containing a material such as boron or hafnium used to control the power of a nuclear reactor. By absorbing neutrons, a control, when dropped into the fuel core, halts the chain reaction by which the reactor generates heat.

Control Room - the operation center of a nuclear power plant from which the plant can be monitored and controlled.

Coolant - liquid or gas circulated through a nuclear reactor remove or transfer heat. Common coolants are water, heavy water, carbon dioxide, liquid sodium, and sodium - potassium alloy.

Cooling Tower - the structure where hot water in condenser coils is circulated for cooling and then returned to the condenser. Cooling towers are now common to most power plants, whether they use coal, oil or nuclear fuel to make steam.

Core - the part of a nuclear reactor containing the fuel assemblies, which generate heat by fission.

Corrective Actions - emergency measures taken to mitigate or terminate an emergency condition. Corrective actions are taken by the facility operator.

Criticality - the point at which a nuclear reactor is just capable of sustaining a chain reaction.

Critical Mass - the smallest amount of fuel necessary to sustain a chain reaction.

Critical Size - the minimum size to just yield criticality for a specified core composition and shape, assuming criticality is possible for the composition.

Decay Heat - the heat produced by radioactive atoms in a reactor after the reactor has been shut down.

Deplete - to reduce the fissile content of an isotopic mixture, particularly uranium.

Dissemination - a dissemination of data is an exchange of information between parties. The information may be technical parameters, dose projections, requests for assistance, etc.

Dose - the amount of radiation received by an organism as measured in energy deposited per mass of tissue (unit is the rem or Sievert).

Dose Equivalent - the radiation dose multiplied by the relative biological effectiveness for the radiation type (unit is the rem or Sievert).

Dosimeter - 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.

Emergency - situations or conditions which have the potential for causing damage to property and/or which may lead to offsite radiological consequences.

Emergency Action Levels (EALs) - there are four levels of emergency action to provide early and prompt notification. The action levels increase to assure fuller response preparation for the more serious indicators.

Emergency Classifications - Mutually exclusive groupings of the various incidents which could occur, including the entire range of possible radiological emergencies.

Emergency Control Center (ECC) - the designated onsite location from which control and/or coordination of onsite emergency actions are affected.

Emergency Core Cooling System (ECCS) - systems engineered into the design of the core in the absence of the primary cooling system. Includes systems such as high pressure core injection (HPCI), low pressure core injection (LPCI), core sprays, etc.

Emergency Director - the designated facility employee having the responsibility and authority for implementing the Emergency Preparedness Plan at the nuclear generating station.

Emergency Measures - a collective term encompassing the assessment, corrective, and protective actions taken during the course of the emergency conditions.

Emergency Operations Center (EOC) - the designated offsite location from which control and/or coordination of emergency actions are affected.

Emergency Planning Zone (EPZ) - a geographic area of fixed radius from the nuclear facility for which planning consideration has been given in order to ensure that appropriate emergency measures can be implemented to mitigate the consequence of the incident. There are two emergency planning zones; ten-mile EPZ and fifty-mile EPZ.

Engineered Safety Systems - systems engineered into the design of the facility to prevent the release of radioactivity, or to mitigate the consequences of the release in the event of an accident.

Enriched Fuel - uranium which has been modified by increasing the concentration of the fissionable isotope, uranium-235. Enriched fuel is more able to sustain a chain reaction and is normally used as the fuel for a nuclear power plant.

Event Tree - an analytical device for identifying the possible sequences that may result from choices and for calculating the probabilities associated with each sequence.

Exclusion Area - the area immediately surrounding a nuclear facility and to which the public does not have free access; often is just the facility site.

Fast Neutrons - neutrons that have not been thermalized, (i.e., having energy comparable to their energy immediately after production from fission).

Fast Reactor - a reactor that does not moderate fission neutrons and that is intended to take advantage of the higher neutron yield from fission induced by fast neutrons.

Fault Tree - an analytical device in which probability and modes of system failure are determined by identifying how subsidiary systems contribute to failure; contributors to subsystem failure are then identified, and so on, until reaching components whose failure rates are known.

Feedwater - water, usually from a condenser, supplied to replenish the water inventory of any component, but particularly a boiler or steam generator.

Fifty-Mile Zone - with a fifty-mile radius of the facility, protective actions are necessary to minimize the ingestion of radioactivity from potential contaminated foodstuffs and water supplies.

Fission Products - the highly radioactive particles/atoms remaining from a fission event. Normally contained in the reactor fuel, but may be released in the fuel damage.

Fuel - basic chain-reacting material.

Fuel Assemblies - separate bundles of fuel rods. A nuclear reactor core contains scores of fuel assemblies and more than 100,000 fuel rods.

Fuel Rods - long hollow rods, usually of a zirconium alloy, into which are packed thimble-sized pellets of uranium.

General Emergency - events that are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity.

Half-life - term used to describe the time rate at which radioactive materials decay into stable elements. One half of the atoms present will decay in a half-life. In the second half-life, half of the remaining (1/4 of the initial amount) atoms will decay, and so forth.

Heat Exchanger - a device that transfers heat from one material, such as water or gas, to another substance with no direct contact between the two materials.

Hot (cold) Leg - the portion of a coolant circuit (usually primary) through which the coolant exits (enters) the site at which it is heated, (i.e., the reactor vessel).

Host (County or State) - the area in which the fixed nuclear facility is located.

Implementing Procedures - step-by-step procedures which implement the provision of the Emergency Preparedness Plan.

Ingestion Pathway - a possible route by which radioactive material from a nuclear facility is introduced into the environment and is subsequently ingested by members of the population. Principle exposure from this pathway would be ingestion of contaminated food or water.

Linear Power - usually refers to power generation per length of fuel rod.

Loss-of-Coolant Accident (LOCA) - a reactor accident in which reactor coolant is lost from the primary system due to leaks and/or pipe failures.

Low Population Zone - a zone around a nuclear facility in which the population is small enough for evacuation to be effective in a short enough time to avoid large radiation doses, should a large radioactive release occur.

Maximum Permissible Concentration - the maximum concentration of specific radionuclides in environmental media (air and water), determined by calculation of the dose equivalent resulting from exposure of workers (for 40 hours per week) or of the public (for 168 hours per week).

Maximum Permissible Dose - an established limit on the radiation exposure a member of the general public can legally receive from a nuclear power plant.

Melt-down (China Syndrome) - the overheating of a reactor core, usually as a result of loss of coolant, to the extent that uranium melts through the metal cladding on the fuel rod. It is believed in extreme cases that heat in the core could become so intense that the core would melt through the reactor vessel and down through the concrete floor of the containment vessel.

Millirem - a measure of radiation dose. A millirem is one-thousandth (1/1000) of a rem (Roentgen Equivalent Man), the basic measure of radiation dose. A chest X-ray exposes a person to between 20 and 30 millirem.

Net Energy - the available energy from a system, (i.e., the energy produced by the system, less the energy to produce and operate the system).

Notification - the initial communication between parties which informs of the existence of an emergency situation. A notification may also be a communications which informs of a change in the emergency situation.

Notification of Unusual Events - events that are in the process or have occurred which indicate a potential degradation of the level of safety of the plant.

Nuclear Power Plant - a facility designed to convert nuclear energy into electricity.

Nuclear Reactor - the device in which a fission chain reaction can be initiated, maintained, and controlled. Heat from the fission process is used to turn generators for production of electricity.

Nuclear Steam Supply System (NSSS) - the basic reactor and support equipment, plus any associated equipment necessary to produce the steam that drives the turbines.

Offsite - any area outside of the facility's property line.

Once-through Fuel Cycle - a nuclear system wherein nuclear materials are introduced into a reactor only once, they are not recycled.

Onsite - any area within the property upon which the facility operator exercises access control. This also includes the exclusion area.

Plume Exposure Pathway - the means by which the radioactive material released from the facility (plume) may expose the population-at-risk to radiation. This exposure may be external exposure from the passing plume, from contaminated surfaces, or may be from inhalation of the passing plume.

Population-at-Risk - those persons for whom protective actions are being or would be taken.

Population Dose - the summed radiation dose-equivalent to a population group (the unit is person-rem).

Power Density - the power generated per unit volume (usually of the core).

Pressurizer - vessel designed to control pressure within the reactor vessel and main coolant system.

Pressurized Water Reactor (PWR) - the most common type of commercial nuclear reactor in the United States. Coolant in the primary loop is kept under pressure to prevent its boiling.

Projected Dose - a calculated or estimated radiation dose which the population-at-risk may potentially receive as a consequence of an incident.

Protective Actions - actions taken during or after an incident for the protection of the general public from excessive radiation exposure which may occur as a consequence of the incident.

Protective Action Guides (PAGs) - Projected general public radiological dose rate or dose commitment criteria which provide guidance to local and/or State officials for the implementation of protective actions for the protection of the general public from excessive radiation exposure following an emergency nuclear incident.

Radiation - refers to the process of emitting energy in the form of rays, alpha, beta, or gamma radiation.

Alpha Radiation - the least penetrating type of radiation. Alpha radiation can be stopped by a sheet of paper.

Beta Radiation - emitted from a nucleus during fission. Beta radiation can be stopped by an inch of wood or a thin sheet of aluminum.

Gamma Radiation - a form of electromagnetic, high energy radiation emitted from a nucleus. Gamma rays are essentially the same as X-rays and require heavy shielding, such as lead, brick, to stop them.

Radioactive Decay - the process by which a nucleus of one type transforms into another, accompanied by emission of radiation.

Radioactivity - the property possessed by some elements, such as uranium, of spontaneously emitting alpha, beta or gamma rays.

Reactor Containment - steel and reinforced concrete structure housing the nuclear reactor and steam generator.

Reactor Coolant Loop - the piping through which the reactor coolant circulates. Coolant is heated in the reactor and then pumped under pressure to the steam generator, where it heats water in the secondary loop into steam that turns the turbines.

Reactor Coolant Pump - a piece of equipment designed to move the coolant through the primary loop so that the heat generated in the core can be transferred to the steam generator.

Reactor Trip - an automatic procedure by which control rods are rapidly inserted into the core of a reactor to stop the chain reaction.

Recovery Actions - actions taken after the emergency to restore the affected area, as nearly as possible, to the pre-emergency conditions.

Refill - the period after LWR loss of coolant during which injected water fills the reactor vessel to the bottom of the core.

Reflector - material placed around the core (and blanket, if any) to reflect escaping neutron back into the core; the reflector, therefore decreases neutron loss and critical size.

Reflood - the period during an LWR LOCA (and after refill), when injected water covers the core; see also refill.

Relief Tank - a tank designed to condense and store excess steam and water discharged through the pressurizer relief valves.

Relief Valve - designed to reduce excess pressure in the reactor coolant system.

REM - an acronym for Roentgen Equivalent Man, a measure of radiation exposure that indicates the potential impact on human cells.

Residual Heat Removal System (RHRS) - a 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 terminated. The Residual Heat Removal System normally operates during core cooldown and refueling operations.

Roentgen – Measurement for exposure to ionizing radiation.

Scram - the rapid shutdown of a reactor by insertion of control rods.

Secondary Loop - the piping through which water circulates from steam generators to turbines, then through the condenser and back through the steam generator.

Shielding - material, such as lead or concrete, around a nuclear reactor used to prevent the escape of radiation and to protect workers and equipment.

Sievert – The SI unit for dose equivalent. 100 Sieverts are equal to 1 Rem.

Site Area Emergency - events that are in process or have occurred which involved actual or likely major failures of plant functions needed for the protection of the public.

Spent Fuel - nuclear fuel, containing fission products, that can no longer economically sustain a chain reaction.

Steam Generator - the apparatus in which the heat from the reactor coolant is transferred to the secondary system, creating steam.

Survey Instrument (geiger counter) - an instrument for detecting and measuring beta and gamma radiation.

Ten-mile Zone - within a ten-mile radius of the facility 90% of the population must be notified within thirty minutes of a Site Area or General Emergency, and 100% of the population notified within one hour of a Site Area or General Emergency of the necessary protective actions such as sheltering or evacuation

Thyroid Blocking Agent - (Thyroid Prophylaxis) a controlled drug used to limit the uptake of ingested or inhaled radioiodine by the body. A protective action.

Turbine-Generator - the device which converts heat energy into electrical energy.

Turbogenerator - device which steam (or some other gas) is allowed to expand, thereby, doing work that drives an electric generator.

Uranium - a radioactive element. The basic fuel of a nuclear reactor.

Warning - notification that an emergency exists and that some action is required on the party of the recipient. County and State authorities are notified, the public is warned.

Waste Disposal - the disposition of nuclear wastes, including fission products or actinides, at a site for long-term or permanent storage or burial.

Waste Storage Tank - a holding tank for liquid or gas wastes, which may be radioactive, prior to reprocessing or disposal.

Zirconium - a metallic element, highly resistant to corrosion, used as cladding on nuclear fuel elements.