

# *Nuclear Safety Glossary*

*February 2012*

**Publication:**

**Comissão Nacional de Energia Nuclear – CNEN**

**Divisão de Normas – DINOR**

**Address: Rua General Severiano, 90 - Botafogo**

**Rio de Janeiro - RJ - Brasil**

**CEP 22290-901**

**E-mail: [dinor@cnen.gov.br](mailto:dinor@cnen.gov.br)**

**Phone: 55 (21) 2173-2380**

**Fax.: 55 (21) 2173-2383**

**<http://www.cnen.gov.br>**

# Summary

<b>1</b>	<b><i>Objective</i></b>	<b>5</b>
<b>2</b>	<b><i>Scope</i></b>	<b>5</b>
<b>3</b>	<b><i>Methodology</i></b>	<b>6</b>
<b>4</b>	<b><i>Terms and Definitions</i></b>	<b>7</b>
	<i>A</i>	<b>7</b>
	<i>B</i>	<b>10</b>
	<i>C</i>	<b>11</b>
	<i>D</i>	<b>14</b>
	<i>E</i>	<b>16</b>
	<i>F</i>	<b>18</b>
	<i>G</i>	<b>19</b>
	<i>H</i>	<b>20</b>
	<i>I</i>	<b>20</b>
	<i>J</i>	<b>24</b>
	<i>K</i>	<b>24</b>
	<i>L</i>	<b>24</b>
	<i>M</i>	<b>25</b>
	<i>N</i>	<b>27</b>
	<i>O</i>	<b>30</b>
	<i>P</i>	<b>31</b>
	<i>Q</i>	<b>35</b>
	<i>R</i>	<b>36</b>

	<i>S</i>	40
	<i>T</i>	46
	<i>U</i>	49
	<i>V</i>	50
	<i>W</i>	51
	<i>X</i>	51
	<i>Y</i>	51
	<i>Z</i>	52
<b>5</b>	<i>Acronyms</i>	53
<b>6</b>	<i>Appendices: Quantities and Units of Ionizing Radiation</i>	56
	<i>Table 1: Radioactivity Quantities</i>	56
	<i>Table 2: Radiometric Quantities</i>	57
	<i>Table 3: Coefficients of Interaction</i>	58
	<i>Table 4: Dosimetric quantities</i>	59
	<i>Table 5: Limiting Quantities Used in Radiological Protection for External Radiation</i>	59
	<i>Table 6: Operational Quantities for Radiation Protection (ICRU 47 and 51)</i>	60
	<i>Table 7: Radiation Protection Magnitude for Internal Dosimetry</i>	60

### 1 - Objective

According to the Laws 4.118/62, 6.189/74 and 7.781/89, CNEN is the Brazilian organization responsible for issuing specific directives relative to nuclear safety and radiological protection, as well as establishing safety standards in order to minimize the risks associated with the use of ionizing radiation for peaceful uses, thus contributing to protecting the health of workers in the nuclear industry, the general population and the environment.

This glossary was prepared aiming at establishing a standardization of technical terms relating to nuclear safety and radiological protection to be used in Brazilian nuclear standards, regulations and other CNEN publications.

This work was translated to the English language in order to increase the understanding about the nuclear safety terminology adopted in Brazil and facilitate the information exchange in international forums.

### 2 - Scope

The scope of this Nuclear Safety Glossary focuses on the main terms used specifically in the areas of nuclear safety and radiological protection. Some general categories of terms were not included in this glossary (except when a specific explanation is needed for a particular term). They are:

- a) The basic terms of radiation and nuclear physics;
- b) The specialised terminology of areas other than safety and protection (e.g. geology, meteorology and medicine). This terminology may be used in areas of safety and security but the definition of such terms is left to specific publications, and
- c) The very specialized terminology of a particular area of protection and safety (for example: the terminology of detailed dosimetry and safety assessment). If necessary, this terminology can be defined in specialized publications.

On the other hand, the definitions are simple, objective and general as much as possible, without referring to a specific facility or situation.

It was avoided to appeal to any other terms and to mention any normative criteria, which shall be presented in the standard itself.

This glossary do not intended to exhaust all the terms referred in the scope. New terms, when necessary, will be introduced in annual reviews.

The abbreviations and acronyms commonly used are listed in Chapter 5. Some useful quantities and units are presented in the Annex.

### 3 - Methodology

Besides the relevant legislation and nuclear regulations, the documents listed below were the basis for the preparation of this glossary:

- 1) Vocabulário Internacional de Termos Fundamentais e Gerais de Metrologia. Portaria INMETRO nº029 de 1995;
- 2) Grandezas e Unidades para Radiação Ionizante. LNMRI/IRD. 2002;
- 3) Safety Glossary - Terminology Used in Nuclear Safety and Radiation Protection. IAEA. 2007 edition;
- 4) NRC Full Text Glossary. U.S. Nuclear Regulatory Commission;
- 5) Recommendations of the ICRP - Publication n. 60. ICRP. 1990;
- 6) Glossário editado por Furnas Centrais Elétricas S. A. 1980;
- 7) Plano de Emergência Local (PEL) da Central Nuclear Almirante Álvaro Alberto.

The DRS hired Mrs. Miriam Dias Pacheco, Master of Science, to develop this glossary. The methodology used was:

- a) compilation of existing terms in the Brazilian nuclear standards. At this stage, it was observed that the same term is defined differently in several regulations;
- b) comparison with terms of the references to harmonize definitions;
- c) selection of terms to be included or excluded in view of the purpose and scope defined above.

The 2012 version was revised by CNEN/DRS/Regulations Division and incorporated comments from the nuclear regulations committee in progress.

It is intended that the text presented here be subject to timely and continuous review. Comments can be sent via e-mail: [dinor@cnen.gov.br](mailto:dinor@cnen.gov.br)

---

- 01) Absorbed dose** - See Annex on Quantities and Units. (pt-BR: *Dose Absorvida*)
- 02) Accident** - any unintended event, including operating errors and equipment failures, whose real or potential consequences are relevant from the point of view of radiological protection and nuclear safety. (pt-BR: *Acidente*)
- 03) Accident with damage to the reactor core** - accident that exceeds the design basis and involves significant degradation of the fuel elements. (pt-BR: *Acidente com danos ao núcleo do reator*)
- 04) Accidental exposure** - involuntary exposure due to accident situations or sabotage. (pt-BR: *Exposição acidental*)
- 05) Action level** - value of dose rate or radionuclides activity concentration adopted in emergency or chronic exposure situations, which is established based on a realistic exposure model. If the values are above this level, protective or remedial actions should be undertaken making sure that the corresponding intervention level is obeyed. (pt-BR: *Nível de ação*)
- 06) Activation** - process of making a radioisotope by bombarding a stable element with neutrons or protons. (pt-BR: *Ativação*)
- 07) Activities that affect the quality** – activities such as design, procurement, manufacturing, construction, assembly, installation, testing, operation, maintenance, repairs, recharging, modifications and inspections that must be performed taking into consideration the quality assurance. (pt-BR: *Atividades que influem na qualidade*)
- 08) Activity** - see Annex on Quantities and Units. (pt-BR: *Atividade*)

- 
- 09) Activity meter** - instrument to measure radionuclide activity. (pt-BR: *Medidor de atividade*)
- 10) Air sampling** - collection of air samples to measure the radioactivity of gases, aerosols or particulate materials in the air. (pt-BR: *Amostragem de ar*)
- 11) Alarm device** - apparatus designed to detect and alert through audible and / or visible signals any type of intrusion or interference. (pt-BR: *Dispositivo de alarme*)
- 12) Alert** - situation that is takes place at the moment when it is verified: a) an initial condition that indicates a real or probable deterioration of the safety level; b) the confirmation or prediction that it has occurred or probably will occur a leak or not scheduled release of non significant quantities of radioactive material, but without putting in risk the health of people inside or outside the plant. (pt-BR: *Alerta*)
- 13) Anticipated transient without scram** - accident known as "worst cases ", considered in the design of the facility which occurs in the event of a reactor shutdown system failure during an expected transient. (pt-BR: *Transiente esperado sem desligamento rápido*)
- 14) Applicant** - person or entity authorized by Law that requests to CNEN, approval, license, authorization or any other administrative action provided in Standards. (pt-BR: *Requerente*)
- 15) Area monitoring** - monitoring of certain areas of a facility including quantities measurement regarding external radiation fields, surfaces contamination and atmospheric contamination. (pt-BR: *Monitoração de área*)
- 16) Atmospheric dispersion** – combination of atmospheric diffusion with atmospheric transport. (pt-BR: *Dispersão atmosférica*)
- 17) Atmospheric diffusion** - lateral and vertical spread of the cloud of effluents followed by mixing with air caused by the turbulent motion of the atmosphere. (pt-BR: *Difusão atmosférica*)
- 18) Atmospheric transport** - displacement of the effluents cloud along with the air. (pt-BR: *Transporte atmosférico*)
-

- 
- 19) Attenuation** – process by which the number of particles or photons that enters a body of matter is reduced by absorption and scattered radiation. (pt-BR: *Atenuação*)
- 20) Audit** - documented activity performed in order to determine, through examination and objective evidence evaluation, the adequacy of procedures and instructions and the adherence to technical standards, specifications or other applicable regulatory requirements, as well as the effectiveness of their implementations. (pt-BR: *Auditoria*)
- 21) Authorization** - act by which CNEN grants permission to carry out a specific activity necessary for the operation of a facility. (pt-BR: *Autorização*)
- 22) Authorization for Initial Operation** - act by which CNEN authorizes the initial operation of a nuclear facility under specified conditions and for a specified period of time. (pt-BR: *Autorização para Operação Inicial (AOI)*)
- 23) Authorization for Operation** - act by which CNEN authorizes the operation of a nuclear facility under specified conditions and for a specified period of time. (pt-BR: *Autorização para Operação*)
- 24) Authorization for the Use of Nuclear Material** - authorization granted by CNEN as part of the installation licensing steps, after verifying that the facility is qualified to use nuclear material in the proposed activity. (pt-BR: *Autorização para Utilização de Material Nuclear (AUMAN)*)
- 25) Authorization for the acquisition of radiation sources** – act by which CNEN authorizes the acquisition of radiation sources. (pt-BR: *Autorização para aquisição de fontes de radiação*)
- 26) Authorization for Commissioning** - act by which CNEN authorizes the commissioning of a facility. (pt-BR: *Autorização para Comissionamento*)
- 27) Authorization for Permanent Operation** - act by which CNEN authorizes the permanent operation of a nuclear facility, under specified conditions and for a specified period of time, after completion of the initial operation with a nominal capacity under normal conditions and during a continuous period of time, as established by CNEN. (pt-BR: *Autorização para Operação Permanente (AOP)*)
-

---

**28) Avertable dose** - dose that can be avoided by one or more protective actions. (pt-BR: *Dose evitável*)

---

---



---

**01) Batches** - portion of nuclear material handled as a unit for accounting purposes at a key measurement point and for which the composition and quantity are defined by a single set of specifications or measurements. The nuclear material may be in bulk form or contained in a number of separate items. (pt-BR: *Lote*)

**02) Bioassay** – analysis technique used to determine types, quantities or concentrations of radioactive material and, in some cases by direct measurement in the human body (in vivo) or analysis and evaluation of excreted or removed materials from the human body (in vitro). (pt-BR: *Bioanálise*)

**03) Biological half-life** – the time required for the amount of a material inside a tissue, an organ, a body region, or any other specific system, to decay to one half of its original amount, as a result of biological process. (pt-BR: *Meia-vida biológica*)

**04) Book inventory** - algebraic sum of the most recent physical inventory of a material balance area, and of all inventory changes that have occurred since that physical inventory was taken. (pt-BR: *Inventário de livro*)

**05) Boundary conditions for operation** - minimum levels of performance or operational capability of systems or components required for the safe operation of a facility, as defined in technical specifications. (pt-BR: *Condições limites para operação*)

**06) Brachytherapy** – radiation therapy by using one or more sealed sources emitting gamma or beta rays used for surface, intracavitary or interstitial applications. (pt-BR: *Braquiterapia*)

---

---

**07) Brazilian Nuclear Program** - set of projects and activities related to the use of nuclear energy for pacific purposes and according to the Government's guidance, control and supervision. (pt-BR: *Programa Nuclear Brasileiro (PNB)*)

**08) Burn-up rate** – ratio between the energy generated by nuclear fission and the mass of fissionable material spent to generate this energy. (pt-BR: *Taxa de queima*)

---



---

**01) Calibration** – set of operations that establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system or values represented by a material measurement or a reference material, and the corresponding values of the quantities established by standards. (pt-BR: *Calibração*)

**02) Carrier** - any person or entity undertaking or owner of the transport unit responsible for the carriage of radioactive material. The term includes both carriers for hire or carriers on own account. (pt-BR: *Transportador*)

**03) Chronic exposure** - exposure persisting in time (pt-BR: *Exposição crônica*).

**04) Clearance level** - value, established by CNEN and expressed in terms of activity concentration and/or total activity, at or below which a source of radiation may be released from regulatory control. (pt-BR: *Nível de dispensa*)

**05) Clearance** - removal of regulatory control of radioactive materials or objects associated with an authorized practice. (pt-BR: *Dispensa*)

**06) Collective dose** - total effective dose received by a population or a group of people, defined as the product of the number of

---

---

individuals exposed to a ionizing radiation source by the average value of the distribution of effective dose of these individuals. The collective dose is expressed in person-sievert. (pt-BR: *Dose coletiva*)

**07) Commissioning** – process during which systems and components of a facility, after its construction and assembly, are made operational and then the compliance with the design features and performance criteria is verified. (pt-BR: *Comissionamento*)

**08) Committed dose** - committed absorbed dose, committed equivalent dose or committed effective dose, depending on the context. See Annex on Quantities and Units. (pt-BR: *Dose comprometida*)

**09) Competent authority** - national or international authority recognized or appointed to decide on matters under discussion which are object of rules and regulations. (pt-BR: *Autoridade competente*)

**10) Compliance assurance** – systematic program of measures enforced by CNEN in order to ensure that the regulatory requirements are fulfilled in practice. (pt-BR: *Garantia de conformidade*)

**11) Confinement (ENTOMB)** - decommissioning strategy in which radioactive contaminants are contained in a material structure that is strong enough until the radioactivity decays to levels that permit the site to be released for unrestricted or restricted use, according to the defined criteria by CNEN. (pt-BR: *Confinamento (ENTOMB)*)

**12) Confinement system (for nuclear reactors)** - barriers and associated systems -including ventilation- designed to isolate the areas that contain radioactive substances from the environment or from areas where it is normally expected a radiation level smaller than those inside the area to be confined by the barriers. (pt-BR: *Sistema de confinamento (para reatores nucleares)*)

**13) Confinement system (for transport)** - Set consisting of the fissile material and components of its packaging, specified by the designer and approved by the competent authority, in order to maintain the system subcritical. (pt-BR: *Sistema de confinamento (para transporte)*)

---

- 
- 14) Construction fire brigade (or simply construction brigade)** – group formed to perform activities of fire protection at the facility under construction as well as in its site. (pt-BR: *Brigada de incêndio da construção (ou simplesmente brigada da construção)*)
- 15) Construction permit** – act through which CNEN permits the construction of a facility, under specified conditions, after verifying the technical feasibility, the safety concept of the design and its compliance with the approved site. (pt-BR: *Licença de construção*)
- 16) Containment device (Containment)** - device that restricts or control the displacement of or access to nuclear material. (pt-BR: *Dispositivo de contenção (contenção)*)
- 17) Control rod** - bar, plate or tube containing material of large neutron absorption cross section such as hafnium, cadmium, boron, etc., used to control the power of a nuclear reactor by absorbing neutrons and preventing them to produce additional fissions. (pt-BR: *Barra de controle*)
- 18) Control room** - room containing the controls and instrumentation necessary to control the reactor and auxiliary systems operational conditions, so that in normal, abnormal and in accident conditions their operation and shutdown procedure are reliable and safe. (pt-BR: *Sala de controle*)
- 19) Controlled area** - area subject to special protection and safety aiming at controlling normal exposures, preventing radioactive contamination spread as well as preventing potential exposures or limiting its range. (pt-BR: *Área controlada*)
- 20) Core component** - any item, besides the fuel element that remains in the reactor core during plant operation. (pt-BR: *Componente do núcleo*)
- 21) Critical group** - group (hypothetical) of individuals from the public, whose exposure to a specific radiation source, or exposure route, is reasonably homogeny and typical of individuals receiving higher equivalent doses due to that source. This group is taken into account in order to verify the compliance with the dose criteria established. (pt-BR: *Grupo crítico*)
- 22) Critical mass** - minimum mass of fissile material with which, under defined geometrical and physical conditions, criticality is
-

---

reached. (pt-BR: *Massa crítica*)

**23) Critical heat flux** – value of the heat flux through a metallic surface and in contact with a boiling liquid when it ceases the continuous contact between the surface and the liquid phase. (pt-BR: *Fluxo crítico de calor*)

**24) Criticality Safety Index** - a number assigned to a package, over-pack or freight container containing fissile material used to provide control over the accumulation of packages, over-packs or freight containers containing fissile material. (pt-BR: *Índice de Segurança de Criticalidade (ISC)*)

---



---

**01) Decommissioning** – technical and administrative actions taken to remove a nuclear facility from the regulatory control. Decontamination - complete or partial removal of radioactive contamination by means of physical, chemical or biological process. (pt-BR: *Descomissionamento*)

**02) Decontamination** - partial or complete removal of radioactive contamination through physical, chemical or biological processes. (pt-BR: *Descontaminação*)

**03) Deferred dismantling (SAFSTOR)** - decommissioning strategy in which the plant is monitored and kept intact for a period of time to allow for radioactive decay of contaminated or activated items. Radioactive materials initially present are processed or placed in a position such that they can be stored and kept secure during this time. Thereafter, the plant will traverse an immediate dismantling as the immediate dismantling strategy. (pt-BR: *Desmantelamento protelado (SAFSTOR)*)

**04) Depleted uranium** - uranium containing a percentage of U<sup>235</sup> lower than in the natural uranium. (pt-BR: *Urânio empobrecido*)

---

- 05) Design basis** - set of information that identifies the specific functions to be performed by an item of a nuclear facility and the specific values, or variation limits of these values, selected for control parameters as fundamental reference data for the design. These values can be:
- a) limitations derived from generally accepted practices, according to the state of the art, to reach functioning aims; or
  - b) requirements derived from the analysis (based on calculation and/or experiments) of postulated accidents effects for which an item should reach its functioning objectives. (pt-BR: *Base de projeto*)
- 06) Deterministic effect** - effect for which there is an absorbed dose threshold necessary for its occurrence and whose severity increases with increasing dose. (pt-BR: *Efeito determinístico*)
- 07) Detriment** - total expected damage due to stochastic effect in a group of individuals and their descendants as a result of this group exposure to ionizing radiation. (pt-BR: *Detrimento*)
- 08) Diagnostic reference level** - value of a particular quantity in the practice of diagnostic, for typical examinations in groups of adult patients, established based on good medical practices and radiological protection. (pt-BR: *Nível de referência de diagnóstico*)
- 09) Discharges** - planned and controlled release into the environment, considered as a legitimate practice within the limits authorized by the regulatory body, of liquid or gaseous radioactive materials produced by nuclear facilities in normal operation. (pt-BR: *Descargas*)
- 10) Dose constraint** – value below the dose limit provided by CNEN as prospective restriction in the individual doses related to a particular ionizing radiation source, used as a superior limit in the process of optimization related to this source. (pt-BR: *Restrição de dose*)
- 11) Dose** - absorbed dose, effective dose, equivalent dose or committed dose, depending on the context. See Annex on Quantities and Units. (pt-BR: *Dose*)
- 12) Dosimeter** - equipment or device used in dosimetry for measuring radiological quantities. (pt-BR: *Dosímetro*)
- 13) Dosimetry** - direct or indirect measurement of radiological

---

quantities. (pt-BR: *Dosimetria*)

---



- 
- 01) Effective dose** - See Annex on Quantities and Units. (pt-BR: *Dose efetiva*)
- 02) Effective multiplication factor,  $K_{eff}$**  - ratio between the total number of neutrons produced in a given period of time, in a finite multiplier medium, and the total number of neutrons (thermal or fast) lost by absorption or escaping at this same period of time. (pt-BR: *Fator de multiplicação efetivo,  $K_{eff}$* )
- 03) Emergency** – abnormal situation that from a certain moment on is out of the operator's planned and expected control requiring special measures to resume normality. (pt-BR: *Emergência*)
- 04) Emergency device** - system, component or equipment designed to meet specific function and with automatic actuation without loss of continuity. (pt-BR: *Dispositivo de emergência*)
- 05) Emergency Planning Zone** - zone where it is recommended that planned immediate and effective actions are in place and would be implemented in order to protect people in the event of a nuclear or radiological accident. (pt-BR: *Zona de Planejamento de Emergência (ZPE)*)
- 06) Emergency situation** - see Emergency. (pt-BR: *Situação de emergência*)
- 07) Enriched uranium** - uranium containing a percentage of  $U^{235}$  greater than 0.72%. (pt-BR: *Urânio enriquecido*)
- 08) Environmental control zone**- area designated in the Emergency Plan of a nuclear facility, with radius of 10 to 25 km around the facility, for which actions are planned for environmental
-

---

protection in case of an emergency. (pt-BR: *Zona de controle ambiental*)

- 09) Environmental monitoring** – continuous, periodical or special measurement of the radiological impact in the environment due to a specific practice. It may include the direct measurement of the radiation by means of measuring devices, the monitoring of effluents released by a facility or the collecting and monitoring of environmental samples. (pt-BR: *Monitoração ambiental*)
- 10) Equivalent dose** - See Annex on Quantities and Units. (pt-BR: *Dose equivalente*)
- 11) Exclusion** - inapplicability of regulatory control to exposures whose intensity and probability of occurrence are not susceptible to such control. (pt-BR: *Exclusão*)
- 12) Exclusion area** - area immediately adjacent to the nuclear plant where the licensed organization or operator has the power to determine the activities deemed necessary for safety purposes, including personnel removal. (pt-BR: *Área de exclusão*)
- 13) Exempted package** – package where the packing, of industrial or commercial-type, contains small quantities of radioactive material with limited radioactivity, and designed to comply with its required regulations, as applicable. (pt-BR: *Embalado exceptivo*)
- 14) Exemption** - regulatory act which exempts a practice, or an associated source to a practice, from a later regulatory control, under the radiological protection viewpoint. (pt-BR: *Isenção*)
- 15) Exemption level:** value established by CNEN and expressed in terms of activity concentration, total activity, dose rate or radiation energy, at or below which a source of radiation may be granted exemption from regulatory control. (pt-BR: *Nível de isenção*)
- 16) Exposure** - act or condition of being subjected to ionizing radiation. (pt-BR: *Exposição*)
- 17) External exposure** - exposure due to radiation sources outside the human body. (pt-BR: *Exposição externa*)
- 18) External fire brigade (or simply external Brigade)** - group with intensive training on fire protection that acts inside the facility under construction when requested by the construction brigade or by the operating facility when requested by the facility brigade.
-

---

(pt-BR: *Brigada de incêndio externa (ou simplesmente Brigada externa)*)

---



---

- 01) Facility** – place for the realization of a practice. The facility may be classified as nuclear facility, radioactive facility, industrial mining facility or waste deposit. (pt-BR: *Instalação*)
- 02) Facility fire brigade (or simply facility brigade)** - group formed to perform activities of fire protection inside the facility. (pt-BR: *Brigada de incêndio da instalação (ou simplesmente brigada da instalação)*)
- 03) Fail-safe principle** – design condition, or device, which automatically triggers safety actions in the event of a failure of a system or component. (pt-BR: *Princípio de falha segura*)
- 04) Final Decommissioning Plan** - a document required for licensing of a nuclear power plant that defines the strategy to be adopted in the decommissioning of the plant. (pt-BR: *Plano Final de Descomissionamento*)
- 05) Final deposit (or repository)** - licensed deposit for storage of radioactive wastes, without the intention of removal, in accordance with the criteria of the competent authorities. (pt-BR: *Depósito final (ou repositório)*)
- 06) Final Safety Analysis Report** – report to be submitted to CNEN at the request of the Initial Operation Authorization. (pt-BR: *Relatório Final de Análise de Segurança (RFAS)*)
- 07) Fire-rated barrier** - a device or element such as slab, wall, plate, blanket, gutter, door, seal and fire-rated valve having a qualified fire resistance. (pt-BR: *Barreira corta-fogo*)
- 08) Fire area** - area enclosed by fire barriers or physical separations determined by fire analysis aiming at preventing the
-

---

postulated fire, for a specified time, from spreading to another adjacent area. (pt-BR: *Área de incêndio*)

- 09) Fire protection** – set of activities and items to prevent, detect, alarm, fight, confine and minimize fire damages. (pt-BR: *Proteção contra Incêndio (PI)*)
- 10) Fire analysis** - analysis of the consequences of a postulated fire for each assessment area, in which should be determined the parameters and characteristics of the fire, in order to verify the adequacy of the fire protection project or establish the necessary modifications. (pt-BR: *Análise de Incêndio (AI)*)
- 11) Fissile material** – any material that under certain conditions can be made fissile by interaction with thermal neutrons. The three main fissile elements are:  $U^{233}$ ,  $U^{235}$ , and  $Pu^{239}$ . (pt-BR: *Material físsil*)
- 12) Free area** - any area that is not classified as a controlled or supervised area. (pt-BR: *Área livre*)
- 13) Fuel cladding** - housing directly adjacent to the nuclear fuel to protect it from the chemically active environment and prevent the release of fission products. (pt-BR: *Revestimento do combustível*)
- 14) Fuel element (or fuel assembly)** - set of bars, rods or plates containing nuclear fuel whose integrity is kept by means of appropriate components. (pt-BR: *Elemento combustível*)
- 15) Fuel rod (or simply rod)** – fuel element component, constructively independent, containing the nuclear fuel in a tight way. (pt-BR: *Vareta combustível - (ou simplesmente Vareta)*)



- 
- 01) Gamma radiography equipment** – equipment consisting of one radiator containing a sealed source, for industrial radiography.
-

---

(pt-BR: *Equipamento de radiografia gama*)

**02) Gauging** - see Calibration. (pt-BR: *Aferição*)

**03) General emergency** – situation involving imminent or real substantial degradation of the reactor core with potential loss of containment. (pt-BR: *Emergência geral*)

---

---



---

**01) Half life** - time required for the activity of a given radioactive material to reach one half of its original value as a result of a radioactive decay process. (pt-BR: *Meia-vida*)

**02) High enriched uranium** – uranium containing 20% or more of the U<sup>235</sup> isotope. (pt-BR: *Urânio altamente enriquecido*)

---

---



---

**01) Important item to safety** – item that includes, or is included in:

- a) structures, systems and components whose failure or malfunctioning may cause undue exposure to radiation of the facility staff or the general public;
  - b) structures, systems and components, which prevent that foreseeable operational events result in accident conditions;
  - c) devices necessary to mitigate the consequences of failures or malfunctioning of structures, systems and components mentioned in items a) and b) above. (pt-BR: *Item importante à*
-

---

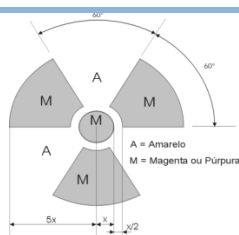
segurança)

- 02) Independent Technical Supervision Organization** – entity accredited by CNEN to independently perform activities of quality assurance. (pt-BR: *Órgão de Supervisão Técnica Independente (OSTI)*)
- 03) Individual monitoring** – monitoring of the external dose, contamination or incorporation of radionuclides in individuals. (pt-BR: *Monitoração individual*)
- 04) Industrial mining facility with uranium and/or thorium** – site where raw material containing the natural series of the uranium and/or thorium radionuclides are mined, processed and industrialized, including waste deposit and places for residues storage. (pt-BR: *Instalação mineiro-industrial com urânio e/ou tório associado*)
- 05) Industrial package** – package where the packing of reinforced industrial-type contains material of low specific activity or object with low contamination on its surface, designed to comply with the required regulations, as applicable. (pt-BR: *Embalado industrial*)
- 06) Industrial radiography** – Non-Destructive Testing using radioactive sources. (pt-BR: *Radiografia industrial*)
- 07) INES Scale (International Nuclear Event Scale)** – scale designed to promptly disclose in a consistent way to the public, the severity of events that occur in nuclear or radioactive installations. The scale should not be confused with emergency classification systems and should not be used as basis for response actions to emergency. (pt-BR: *Escala INES (International Nuclear Event Scale)*)
- 08) Initial deposit** – deposit for radioactive wastes storage until its removal or transfer. The initial deposit can be part of a nuclear or radioactive facility. (pt-BR: *Depósito inicial*)
- 09) Initial operation** - set of commissioning activities performed with nuclear material to verify the design basis and demonstrate, when applicable, that the facility can withstand both the expected transients and postulated accidents. (pt-BR: *Operação Inicial*)
- 10) Initial Operations Report** – summarized report on the nuclear power plant starting-up tests program, including criticality tests,
-

---

low power operation and power raising up to the nominal value. (pt-BR: *Relatório de Operações Iniciais (ROI)*)

- 11) Immediate dismantling (DECON)** - decommissioning strategy in which equipment, structures and parts of the plant containing radioactive contaminants are removed or decontaminated to levels that permit the site to be released for unrestricted use or restricted, according to defined or supported criteria by CNEN. (pt-BR: *Desmantelamento imediato (DECON)*)
- 12) Inspection** – examination, observation, measurement or testing performed in order to evaluate structures, systems and components and materials as well as operational activities, technical processes, organizational processes, procedures and staff competence. (pt-BR: *Inspeção*)
- 13) Institutional control** - control kept on final deposit or area of restricted use due to a facility decommissioning in order to limit the dose to the population, which involves: maintenance of records, delimitation of areas, restrictions regarding the use of the land, the environmental radiological monitoring program, periodic inspections and corrective actions deemed necessary. (pt-BR: *Controle institucional*)
- 14) Intake** – activity of certain radioactive material at the time of its admission in the human body by ingestion, inhalation, or penetration through the skin or wounds. (pt-BR: *Incorporação*)
- 15) Intermediate deposit** – deposit for receiving and eventually packing radioactive wastes aiming at its future removal for a final deposit. (pt-BR: *Depósito intermediário*)
- 16) Internal exposure** – exposure to radiation due to radiation source inside the human body. (pt-BR: *Exposição interna*)
- 17) International symbol of ionizing radiation** - symbol internationally used to indicate the presence of ionizing radiation. See figures below: (pt-BR: *Símbolo internacional da radiação ionizante*)
-



- 18) Intervention** - all action taken for reducing or avoiding the exposure or exposure probability to sources that do not belong to a controlled practice, or are out of control due to an accident or a sabotage. (pt-BR: *Intervenção*)
- 19) Intervention level** - level of avertable dose at which a remedial or a specific protective action is taken in an emergency or a situation of chronic exposure. (pt-BR: *Nível de intervenção*)
- 20) Inventory change** – increase or decrease of nuclear material in a material balance area. (pt-BR: *Variação de inventário (variação)*)
- 21) Investigation level** - reference level that when reached or exceeded, requires the evaluation of the causes and consequences of events that led to that level, as well as to corrective actions proposition. (pt-BR: *Nível de investigação*)
- 22) Ionizing radiation (or radiation)** – any particle or electromagnetic radiation that when interacting with the matter displaces electrons from atoms or molecules producing ions. (pt-BR: *Radiação ionizante (ou radiação)*)
- 23) Ionizing radiation international symbol** – symbol internationally used to indicate the presence of ionizing radiation. See figures below: (pt-BR: *Símbolo internacional da radiação ionizante*)
- 24) Irradiator** - equipment used for irradiation, containing a radioactive source that when not in service remains locked inside it and properly shielded. (pt-BR: *Irradiador*)
- 25) Isolation zone** - area adjacent to the physical barrier, without any obstacles that can hide or protect an individual or vehicle. (pt-BR: *Zona de isolamento*)
- 26) Isotopic enrichment** - a process by which the relative abundance of the isotopes of a given element is altered, thus producing a form of the element that has been enriched in one

particular isotope and depleted in its other isotopic forms. The uranium isotopic enrichment is given by the ratio between the combined weight of the  $U^{235}$  and  $U^{233}$  isotopes and the total weight of uranium. The enrichment is normally expressed as a percentage. (pt-BR: *Enriquecimento isotópico*)

**27) Isotopic enrichment plant** – nuclear facility that covers systems, components and structures necessary to increase the concentration of  $U^{235}$  in the natural uranium. The main processes of uranium isotopic enrichment are the gaseous diffusion and gas centrifuge. (pt-BR: *Usina de enriquecimento isotópico*)

**28) Isotopic separation** – physical separation process of different isotopes of a given chemical element, changing their relative abundances. NRC: The process of separating isotopes from one another, or changing their relative abundances. (pt-BR: *Separação isotópica*)

J

K

L

**01) Leak radiation** - radiation that is not part of the useful beam

---

of radiation derived from a sealed source and that passes through its shield or covering. (pt-BR: *Radiação de fuga*)

**02) Licensee** – A person legally responsible for the institution or facility to whom CNEN has granted a license authorization or any other administrative act of similar nature. (pt-BR: *Titular*)

**03) Licensing basis** – regulatory requirements applied to a facility that may also include agreements and commitments established between the regulatory agency and the licensee. (pt-BR: *Bases de licenciamento*)

**04) Light water reactor** – reactor using ordinary water as coolant, including boiling water reactors (BWRs) and pressurized water reactors (PWRs). (pt-BR: *Reator nuclear a água leve*)

**05) Local Emergency Plan** - Plan created and implemented by the facility operator covering the facility property area. The plan shall contain the measures to be developed in order to protect the population in the event of a radiological accident. (pt-BR: *Plano de Emergência Local (PEL)*)

**06) Loss of coolant accident** - postulated accident caused by disruptions at the boundaries of the primary cooling system resulting in loss of the reactor coolant at a rate greater than the system replacement capacity. (pt-BR: *Acidente de perda de refrigerante (do reator)*)

**07) Low toxicity alpha emitter** – natural uranium, depleted uranium, natural thorium,  $U^{235}$  or  $U^{238}$ ,  $Th^{228}$ ,  $Th^{230}$  and  $Th^{232}$  when contained in ores or physical and chemical concentrates, or alpha emitters with half lives of less than 10 days. (pt-BR: *Emissor alfa de baixa toxicidade*)

---



---

**01) Material balance** - comparison of the book inventory of

---

---

nuclear material and the physical inventory in a specific time interval. (pt-BR: *Balanço de material*)

- 02) Material balance area** - an area in or outside of a facility such that it is possible to determine: the quantity of nuclear material in each transfer into or out of the area; the physical inventory of nuclear material, when necessary, in accordance with specified procedures. (pt-BR: *Área de balanço de material*)
- 03) Material unaccounted for** - amount of nuclear material calculated by the difference between the book inventory and the physical inventory. (pt-BR: *Material Não Contabilizado (MNC)*)
- 04) Measuring device** – device used for measurement, alone or together with other complementary device(s). (pt-BR: *Instrumento de medição*)
- 05) Medical exposure** - exposure to which are subject: a) individuals that out of their occupational situation voluntarily and eventually accompany patients during radiological procedure for therapy or diagnosis; b) volunteers of medical or biomedical research programs and c) patients during diagnosis or therapy. (pt-BR: *Exposição médica*)
- 06) Member of the public** – any member of the population when not subjected to occupational or medical exposure. (pt-BR: *Indivíduo do público*)
- 07) Metrology laboratory** - laboratory accredited by a national authority to develop, implement and/or keep metrological standards of physics quantities, as well as performing the calibration of the instruments and/or gauging, for measuring these quantities. (pt-BR: *Laboratório de metrologia*)
- 08) Milling (of a mineral)** – process of ores crushing, concentration and classification by physical and chemical methods in order to obtain the ore or the mineral with the desired quality. (pt-BR: *Beneficiamento*)
- 09) Mine** - deposit of ores even if discontinued. (pt-BR: *Mina*)
- 10) Mineral of interest for nuclear energy** – any mineral that contains in its composition one or more elements of interest for the development of the nuclear industry. (pt-BR: *Mineral de interesse para a energia nuclear*)
-

- 
- 11) Mining** – set of coordinated operations aiming at covering all stages of industrial exploitation of a mine, up to the ore processing. (pt-BR: *Lavra*)
- 12) Monitoring (or monitoration)** – following-up, by means of devices or operational procedures, the existence and radionuclides activity in people inside a certain place of a facility or in specific materials. Its objective is the contamination control or radiation exposure evaluation, including the interpretation of the results. (pt-BR: *Monitoração*)
- 13) Multilateral approval** – approval by the relevant competent authority of the country of origin of the design or shipment, as applicable, and also, where the consignment is to be transported through or into any other country, approval by the competent authority of that country. The term “through or into” specifically excludes “over”, i.e. the approval and notification requirements shall not apply to a country over which radioactive material is carried in an aircraft, provided that there is no scheduled stop in that country. (pt-BR: *Aprovação multilateral*)
- 



- 
- 01) Natural exposure** - exposure to natural radiation. (pt-BR: *Exposição natural*)
- 02) Natural sources** - radiation sources that occur naturally including cosmic and terrestrial radiations. (pt-BR: *Fontes naturais*)
- 03) Natural uranium** - uranium naturally occurring in the nature that presents an isotopic distribution of approximately 99.28% of  $U^{238}$  and 0.71% of  $U^{235}$ . (pt-BR: *Urânio natural*)
- 04) Neutron capture** – nuclear reaction that occurs when a nucleus captures a neutron. The probability that a given material captures a neutron is proportional to its absorption cross section
-

---

and depends on the neutrons energy as well as on the nature of the material. (pt-BR: *Captura de nêutrons*)

- 05) Nominal capacity** - production capacity in a given period of time specified in the facility design. (pt-BR: *Capacidade nominal*)
- 06) Nonconformity** - deficiency of characteristics, documentation or procedure that makes unacceptable or undetermined the quality of an item. (pt-BR: *Não conformidade*)
- 07) Normal exposure** - expected exposure to an authorized practice with a source or facility in normal conditions of operation, including the minor events not foreseen and kept under control. (pt-BR: *Exposição normal*)
- 08) Normal operation** - operation that includes all possible conditions and events that may occur during the proposed operation, when performed under specified administrative controls and procedures, within operational limits and without events that could affect safety. (pt-BR: *Operação normal*)
- 09) Nuclear activities** - human activities as defined in the Federal Constitution related to services and nuclear facilities of any kind, to the state monopoly over research, mining, enrichment, reprocessing, industrialization and trade of nuclear ores and their derivatives. (pt-BR: *Atividades nucleares*)
- 10) Nuclear element** – every chemical element that can be used to release energy in nuclear reactors or that may give rise to chemical elements that can be used for this purpose. Periodically, the Government, under CNEN's proposal, will specify the elements that shall be considered as nuclear, besides natural uranium and thorium. (pt-BR: *Elemento nuclear*)
- 11) Nuclear emergency** - emergency in which exists, or can occur, danger due to the release of the resulting energy from a nuclear chain reaction or decay of its fission products. (pt-BR: *Emergência nuclear*)
- 12) Nuclear facility** – facility in which nuclear material is produced, processed, reprocessed, utilized, handled or stored in relevant quantities. This definition includes:
- a) Nuclear reactors;
  - b) Plant that uses nuclear fuel for electric or thermal power generation for industrial purposes;
-

- c) Industry or plant for the production or treatment of nuclear materials;
- d) Reprocessing plant of irradiated fuel element. (pt-BR: *Instalação nuclear*) ; and
- e) Storage facility.

**13) Nuclear fuel** - a device capable of producing energy through self-sustaining process of nuclear fission. (pt-BR: *Combustível nuclear*)

**14) Nuclear fuel cycle** – a series of nuclear installations and activities related to the supply of fuel for nuclear power plants. It includes the ore extraction and processing, the conversion into UF<sub>6</sub>, the isotopic enrichment, the fuel element fabrication, the thermonuclear energy generation, the fuel reprocessing for fissile material recovering that remains in the spent fuel and the radioactive waste disposal. (pt-BR: *Ciclo do combustível*)

**15) Nuclear licensing** - process through which CNEN, by means of evaluations and verifications of the safety conditions of a facility, grants, modifies, limits, extends, suspends or revokes acts relative to: placement, construction, transportation, utilization, acquisition of nuclear or radioactive material, operation, decommissioning or, technical modification of a nuclear facility, and by means of aptitude exams and tests, certifies reactor operators qualification as well as radioprotection supervisors. (pt-BR: *Licenciamento nuclear*)

**16) Nuclear material** - material that includes the nuclear elements or their by-products (transuranic elements, U<sup>233</sup>) in any form of association, namely, metal, alloy or chemical combination. (pt-BR: *Material nuclear*)

**17) Nuclear medicine** - medical specialty employing unsealed sources for diagnostic and therapeutic purposes. (pt-BR: *Medicina nuclear*)

**18) Nuclear mineral** - mineral that contains in its composition one or more nuclear elements. (pt-BR: *Mineral nuclear*)

**19) Nuclear ore** - nuclear mineral whose nuclear element or elements occur in proportions and conditions that allow its economical exploitation. (pt-BR: *Minério nuclear*)

**20) Nuclear poison (or simply poison)** - substance that due to

---

its large neutron absorption cross section, reduces the reactor core reactivity. (pt-BR: *Veneno nuclear (ou simplesmente Veneno)*)

- 21) Nuclear power plant (or simply plant)** - a fixed facility endowed with a single nuclear reactor for the production of electric power. (pt-BR: *Usina nucleoeétrica (ou simplesmente usina)*)
- 22) Nuclear power reactor** - nuclear reactor for electrical energy or heat generation for industrial processes. (pt-BR: *Reator nuclear de potência*)
- 23) Nuclear power station (or nucleoelectric station or simply station)** - Fixed industrial complex for production of electricity through one or more nucleoelectrical plants. (pt-BR: *Central nuclear (ou central nucleoeétrica ou simplesmente central)*)
- 24) Nuclear reactor (or simply reactor)** – nuclear facility with nuclear fuel where nuclear fission may be initiated in a self-sustaining and controlled process. (pt-BR: *Reator nuclear (ou simplesmente reator)*)
- 25) Nuclear safety** - set of actions to achieve operational conditions, prevention and control of accidents, or appropriated mitigation of accident consequences, leading to the protection of personnel, general public and environment against unnecessary radiation risks. Safety is achieved by means of technical and administrative measures implemented in a facility during the design, construction, commissioning, operation, maintenance and decommissioning. (pt-BR: *Segurança nuclear*)



- 
- 01) Occupancy factor** - factor, which multiplied by the working load, gives the occupation level of a given area when radiation sources are ready to irradiate. (pt-BR: *Fator de ocupação*)
- 02) Occupational exposure** - normal or potential exposure of individuals as a result of their work or training practices or
-

---

interventions, excluding local natural radiation. (pt-BR: *Exposição ocupacional*)

**03) Occupationally Exposed Person** – person submitted to occupational exposure. (pt-BR: *Indivíduo Ocupacionalmente Exposto (IOE)*)

**04) Operating organization** - a legal person that hold the authorization for the operation or decommissioning of a facility. (pt-BR: *Organização operadora (ou simplesmente operadora)*)

**05) Operation Monthly Report** – operation routine report covering the nuclear power plant operation during the month just ended. (pt-BR: *Relatório Mensal de Operação (RMO)*)

**06) Operational level** - dose level or quantity related to it, established by the operator based on reference levels and on the use of optimization processes. It must be equal or less than the dose limits adopted by CNEN. (pt-BR: *Nível operacional*)

**07) Operational reserve device** – system, component or equipment designed to meet specific function of non automatic actuation, when necessary. (pt-BR: *Dispositivo de reserva operativa*)

**08) Ore processing plant** – plant where the uranium ore is processed concentrating the substance or the chemical element of interest. (pt-BR: *Usina de beneficiamento de minério*)

**09) Overpack** – volume such as a box or bag used by a single consignor in order that one shipment of one or various volumes be consolidated into one manageable unit, for convenient handling, packaging and transportation. (pt-BR: *Sobreembalagem*)

---



---

**01) Package** - volume presented for transport of radioactive

---

---

materials. It includes the packaging and its radioactive contents. (pt-BR: *Embalado*)

- 02) Packing for storage and transportation of radioactive material (or simply packing)** - container with airtight cover, with or without internal coating, whose purpose is to allow the product transport and storage, avoid penetration of external elements and, if necessary, shield the radiation and/or retain radionuclides. (pt-BR: *Embalagem para armazenamento e transporte de material radiativo (ou simplesmente embalagem)*)
- 03) Partial construction licence** - act through which CNEN permits the construction of a part or specific stage of a facility, under stipulated conditions. (pt-BR: *Licença parcial de construção*)
- 04) Personal certification** - formal recognition, through evaluation, that a person meets the requirements established in specific regulations in order to perform a certain activity, function or occupation. (pt-BR: *Certificação individual*)
- 05) Personal dosimeter** - device placed on the clothing or body of a person in order to measure the radiation dose, according to specific rules of use. (pt-BR: *Medidor individual*)
- 06) Physical barrier** – fences, walls, ceiling and floors with proper construction and strength, compatible with the nature of the corresponding security area to prevent intrusion into an enclosed area. (pt-BR: *Barreira física*)
- 07) Physical inventory** - sum of all measured quantities or derived estimates of batches quantities of nuclear material on hand at a given time within a material balance area, obtained in accordance with specified procedures. (pt-BR: *Inventário físico*)
- 08) Physical Protection** - set of measures intended to:  
a) avoid sabotage against material, equipment and installations; b) prevent unauthorized removal of material, specially nuclear material; c) provide means for prompt finding and recovering of the diverted material; d) protect the facility's patrimony as well as the physical integrity of its staff. (pt-BR: *Proteção Física (PF)*)
- 09) Physical Protection Plan** - classified document, which describes the physical protection of a nuclear facility and developed in accordance with CNEN requirements. (pt-BR: *Plano de Proteção Física (PPF)*)
-

- 
- 10) Physical stabilization** – isolation of the waste deposition area by means of a sufficiently thick covering made of resistant materials, such as: compacted clay, soil and concrete, followed by the application to the external surface of a mechanical suitable treatment. (pt-BR: *Estabilização física*)
- 11) Postulate fire** - fire of possible occurrence inside a particular zone of evaluation. (pt-BR: *Incêndio postulado*)
- 12) Postulated accident** - accident whose occurrence is considered as admissible for analysis purposes, aiming at establishing the safety conditions that are able to prevent the accident or minimize its eventual consequences. (pt-BR: *Acidente postulado*)
- 13) Postulated initiating events** – events that lead to foreseen operational situations and to postulated accidents conditions. (pt-BR: *Eventos iniciadores postulados*)
- 14) Potential exposure** – exposure that cannot be predicted with certainty, but that may result as consequence of an accident with a radiation source, or as a result of an event or series of events of probabilistic nature. (pt-BR: *Exposição potencial*)
- 15) Practice** - any human activity that increases the likelihood exposure of people or the number of people exposed to ionizing radiation. (pt-BR: *Prática*)
- 16) Preliminary area of interest** - area identified inside the region of interest, not excluded by the regional analysis, in order to identify the potential sites for the construction of a nuclear facility. (pt-BR: *Área preliminar de interesse*)
- 17) Preliminary Decommissioning Plan** - a document required for licensing of a nuclear power plant that indicates, in a preliminary manner, the strategy to be adopted in the decommissioning of the plant. (pt-BR: *Plano Preliminar de Descomissionamento*)
- 18) Preliminary Safety Analysis Report** – report to be submitted to CNEN at the request of the facility Construction License. (pt-BR: *Relatório Preliminar de Análise de Segurança (RPAS)*)
- 19) Pre-operational tests** – tests carried out during the plant commissioning to demonstrate the capacity of structures, systems and components to meet the safety related operational
-

---

requirements. (pt-BR: *Testes pré-operacionais*)

- 20) Pressurized-water reactor (PWR)** - nuclear power reactor in which the heat generated by fission in the core is transferred to a heat exchanger via the water kept under high pressure in the primary circuit, generating steam in a secondary circuit in order to drive the turbines. (pt-BR: *Reator nuclear a água pressurizada (PWR)*)
- 21) Preventive action zone** - area designated in the Emergency Plan of a nuclear facility, with a radius of 3 to 5 km around the facility, for which urgent and preventive actions are planned in case of an emergency. (pt-BR: *Zona de ações preventivas*)
- 22) Primary barrier** - barrier utilized to reduce the radiation beam. (pt-BR: *Barreira primária*)
- 23) Primary radiation beam** – radiation passing through a window or opening, cone, or any other collimating devices of the radiation source shield. (pt-BR: *Feixe útil de radiação*)
- 24) Primary system** – reactor cooling system. (pt-BR: *Sistema primário*)
- 25) Protected area** - area kept under constant protection, surrounded by a physical barrier with reduced number of controlled access and that involves:  
a) one or more vital areas of a nuclear facility; or  
b) a nuclear facility without a vital area. (pt-BR: *Área protegida*)
- 26) Protection measure** - measure adopted to avoid or reduce the radiation doses that could be received by the population under abnormal exposure conditions. (pt-BR: *Medida de proteção*)
- 27) Protective action** – action taken during an intervention in order to avoid or reduce doses that could be received in emergency exposure or chronic exposure situations. (pt-BR: *Ação protetora*)
- 28) Public exposure** - exposure of individuals of the public to authorized sources and practices or in emergency situations, not including occupational, medical and local natural exposures. (pt-BR: *Exposição pública*)
-

Q

- 01) Quality assurance** – set of systematic and planned actions necessary to provide adequate confidence that a structure, system components or installation will satisfactorily perform in service. (pt-BR: *Garantia da qualidade*)
- 02) Quality Assurance Document** - document, using any media, that defines, describes, specifies, identifies, registers or certifies requirements, measurements or results of activities that influence the quality, such as, specifications, procedures, records, certificates, reports, plans or drawings. (pt-BR: *Documento de garantia da qualidade*)
- 03) Quality Assurance Program** – document for licensing purposes, which presents or describes the commitment for the establishment with the Quality Assurance System. (pt-BR: *Programa de Garantia da Qualidade (PGQ)*)
- 04) Quality Assurance System** – set of measures developed by an organization which is necessary for the effective implementation of quality assurance actions in an enterprise as a whole or in each of its stages. It aims to promote the integration of the elements related to strategic planning, organizational structuring, responsibilities definition and assignments for individuals or groups, adoption of the required administrative and executive procedures, use of appropriate methods and processes and allocation of material and human resources. (pt-BR: *Sistema de Garantia da Qualidade (SGQ)*)
- 05) Quality inspection** - quality control action that by means of testing, observation or measurement, determines the compliance of items, processes, and procedures to the preset quality requirements. (pt-BR: *Inspeção de qualidade*)

- 
- 01) Radiation level** - equivalent dose rate expressed in millisievert/h. (pt-BR: *Nível de radiação*)
- 02) Radiation monitor (or simply monitor)** – radiation measuring device that also provides alert or alarm signals in special conditions. (pt-BR: *Monitor de radiação (ou simplesmente monitor)*)
- 03) Radiation protection officer** - an individual who holds a qualification certificate issued by CNEN, related to his/her scope of work. (pt-BR: *Supervisor de proteção radiológica*)
- 04) Radiation source** - equipment or material that emits or is capable of emitting ionizing radiation or releasing radioactive substances or materials. (pt-BR: *Fonte de radiação*)
- 05) Radioactive contamination** - deposition of undesired radioactive materials in any medium or place. (pt-BR: *Contaminação radioativa*)
- 06) Radioactive facility** - physical space, place, room, or building of any kind where a legal entity uses, produces, processes, distributes or stores radiation sources. (pt-BR: *Instalação radiativa*)
- 07) Radioactive material** – material containing substances which spontaneously emit ionizing radiation. (pt-BR: *Material radioativo*)
- 08) Radioactive mineral** – any mineral that contains nuclear elements in its composition in proportions and conditions such as it does not allow economical exploitation. (pt-BR: *Mineral radioativo*)
- 09) Radioactive residue (or simply residue)** – any remaining substance generated in nuclear or radioactive facilities that contains radionuclides and whose reutilization is possible in accordance to the radioprotection requirements established by
-

---

CNEN. (pt-BR: *Resíduo radioativo (ou simplesmente resíduo)*)

- 10) Radioactive source workload** - the amount of exposure at 1(one) meter from the radioactive source during one week, expressed in C.kg-R per week or R per week. (pt-BR: *Carga de trabalho de uma fonte radioativa*)
- 11) Radioactive waste (or simply waste)** – any material resulting from human activities, containing quantities of radionuclide higher than the exemption limits established by CNEN, whose reutilization is not appropriate or foreseen. (pt-BR: *Rejeito radioativo (ou simplesmente rejeito)*)
- 12) Radioactive waste management (or simply waste management)** - set of technical and administrative activities related to the collection, segregation, handling, packaging, transportation, storage, control and disposal of radioactive wastes. (pt-BR: *Gerência de rejeitos radioativos (ou simplesmente gerência de rejeitos)*)
- 13) Radioactive waste deposition** - placement of radioactive wastes at a facility licensed by the competent authorities, without any foreseen removal. (pt-BR: *Deposição de rejeitos radioativos*)
- 14) Radioactive wastes deposit (or simply deposit)** - a building or place for storage or disposal of radioactive wastes. (pt-BR: *Depósito de rejeitos radioativos (ou simplesmente depósito)*)
- 15) Radioactive effluent** - liquid or gaseous nuclear material produced by a practice and released to the environment in a planned and controlled way. (pt-BR: *Efluente radioativo*)
- 16) Radioactive source** - radioactive material used as a source of radiation. (pt-BR: *Fonte radioativa*)
- 17) Radio-diagnosis** - administration of ionizing radiation for medical diagnosis. (pt-BR: *Radiodiagnóstico*)
- 18) Radiological emergency** - emergency in which exists, or can occur, danger due to the exposure to ionizing radiation. (pt-BR: *Emergência radiológica*)
- 19) Radiological Environmental Monitoring Program Report** - report presenting the results of the parameters listed in the PMARO, for the respective period, by means of environmental samples and based on the critical paths of radionuclides transfer to
-

---

the human being. (pt-BR: *Relatório do Programa de Monitoração Ambiental Radiológico Operacional*)

- 20) Radiological protection (or radiation protection)** - set of measures to protect people from possible undesirable effects of exposure to ionizing radiation. (pt-BR: *Proteção radiológica (ou radioproteção)*)
- 21) Radiological Protection Plan** - document required for the licensing of a facility and that establishes the radiological protection actions that should be implemented by the local radiological protection body. (pt-BR: *Plano de Proteção Radiológica (PPR)*)
- 22) Radiopharmaceutical** - radioactive substance produced for use in nuclear medicine or radio-diagnosis. (pt-BR: *Radiofármaco*)
- 23) Radiotherapy** - medical application of ionizing radiation for therapeutic purposes. (pt-BR: *Radioterapia*)
- 24) Reactor core emergency cooling systems** - reactor system components (pumps, valves, heat exchangers, tanks and piping) specifically designed to remove residual heat from the reactor fuel rods in the event of the normal cooling failure (reactor coolant system). (pt-BR: *Sistemas de refrigeração de emergência do núcleo*)
- 25) Reactor core loading** - set of operations required for placement in the reactor core of a full load of fuel elements and respective core components. (pt-BR: *Carregamento do núcleo do reator*)
- 26) Reactor operator** - individual, licensed by CNEN, who operates a nuclear reactor's controls as part of his/her functions. (pt-BR: *Operador de reator*)
- 27) Recording level** - dose value or quantity related to it, obtained in a monitoring program whose magnitude is important to justify its record. (pt-BR: *Nível de registro*)
- 28) Redundancy** – one or more ways to meet a particular function. These ways are not necessarily identical. (pt-BR: *Redundância*)
- 29) Reference level** – dose level or related quantity, established or approved by CNEN, to determine actions to be developed when this level is reached or expected to be exceeded. It includes
-

recording level, investigation level, action level and intervention level. (pt-BR: *Nível de referência*)

**30) Reference meter** – personal indirect reading meter, kept out of reach of any radiation type, used as a basis for comparison of other meters in usage at working places. (pt-BR: *Medidor de referência*)

**31) Reference standard** – standard generally having the highest metrological quality, available at a certain place or organization, and from which the measurements there performed are derivate. (pt-BR: *Padrão de referência*)

**32) Region of interest** - place initially identified in the selection process and choice of sites to build a plant in a given region. (pt-BR: *Região de interesse*)

**33) Regulatory body** – entity designated by the government of a State as having legal authority for conducting the regulatory process, including issuing, suspending or revoking authorizations and licenses in this State. (pt-BR: *Órgão regulador*)

**34) Relative biological effectiveness** – relative measurement of the effectiveness of different types and energies of radiation to induce a certain health effect. It is defined as the inverse ratio of the absorbed doses of two different radiation types and energies that would produce the same degree of a specific biological effect. (pt-BR: *Efetividade biológica relativa*)

**35) Remedial action** -action taken during an intervention in existing radiation fields to reduce doses. (pt-BR: *Ação remediadora*)

**36) Reprocessing** – set of operations necessary to the removal of fission products and recovering of fertile and fissile materials from the nuclear fuel element, after their utilization in a reactor and aiming at their future reutilization. (pt-BR: *Reprocessamento*)

**37) Reprocessing plant** - nuclear facility that covers systems, components and structures necessary to the separation, recovering, storage and handling of fissile and fertile nuclear materials, by-products and wastes of materials or burned nuclear fuels for later use. (pt-BR: *Usina de reprocessamento*)

**38) Reproducibility (of measurement results)** - degree of

---

conformity of the measurement results, of a same measured, performed under various measuring conditions. (pt-BR: *Reprodutibilidade (dos resultados de medição)*)

**39) Research reactor** - nuclear reactor designed specifically for research purposes and that is not classified as a test reactor. (pt-BR: *Reator nuclear de pesquisa*)

**40) Risk** – (1) resulting mathematical expression of the frequency of the occurrence of a given event by a given consequence that it may causes; (2) probability of a specific effect in the health of an individual or group of individuals as a result of their exposure to radiation. (pt-BR: *Risco*)

---

---



---

**01) Sabotage** - any deliberate act against a facility capable of directly or indirectly, endanger the health and the safety of employees and the general public, or cause economic or social impact. (pt-BR: *Sabotagem*)

**02) Safeguards agreement** - agreement for the application of safeguards concluded between the IAEA and a State or group of States and, in some cases, a regional or multilateral organization, such as EURATOM and ABACC, due to bilateral or multilateral agreements or by the request of a country. (pt-BR: *Acordo de salvaguardas*)

**03) Safety Analysis Report** – report produced by the operator to analyse the size of dangers, establish measures and ways of prevention and control, as well as the quantification of the radiological impact, in compliance with specific standards and submitted to CNEN in order to obtain an authorization or license. (pt-BR: *Relatório de Análise de Segurança (RAS)*)

**04) Safety analysis** - study, examination and description of the expected behaviour of the nuclear facility throughout its lifetime, in normal, transitory and postulated accidents situations, in order to

---

determine: the safety margins foreseen for normal operation and transient situations; b) the adequacy of items to prevent accidents and mitigate the consequences of accidents that may occur. (pt-BR: *Análise de segurança*)

**05) Safety and security optimization** - basic principle recommended by the International Commission on Radiological Protection (ICRP) in order to achieve a protection and safety level in which the amount of individual doses, the number of individuals exposed as well as exposures likelihood are as low as reasonably achievable (ALARA), taking into account economic and social factors. (pt-BR: *Otimização de proteção e segurança*)

**06) Safety culture** - characteristics and attitudes of organizations and individuals that undertake them with higher priority than the safety issues of the facility and which will receive attention proportional to its importance. (pt-BR: *Cultura da segurança*)

**07) Safety evaluation** - a set of activities designed to ensure that the safety analysis of an installation was properly performed and in accordance with the licensing requirements. (pt-BR: *Avaliação de segurança*)

**08) Safety issues that were not evaluated** - problems arising from changes, assays, tests or experiments that:

a) may increase the probability of occurrence or the consequences of accidents or yet the malfunction of items important to safety, which were already evaluated in the Final Safety Analysis Report (FSAR);

b) may generate the possibility of accidents or malfunctioning other than those evaluated in the FSAR;

c) reduce the margin of safety, as defined in the design-basis, for any technical specification. (pt-BR: *Problemas de segurança não avaliados*)

**09) Safety limits** - limits imposed to important operating variables considered as necessary to ensure the integrity of the physical barriers, which protect against uncontrolled release of radioactive materials, as defined in the technical specifications. (pt-BR: *Limites de segurança*)

**10) Safety setup** – configuration in which both the sealed source for gamma radiography is properly shielded and the irradiation device becomes inoperable by means of a locking device or other

---

means. (pt-BR: *Posição de segurança*)

- 11) Safety systems (of a nuclear reactor)** – plant systems and components whose functions are to ensure, in any conditions, the plant safe shutdown, residual heat removal or mitigation of the consequences of anticipated operational events for accident conditions. (pt-BR: *Sistemas de segurança (de um reator nuclear)*)
- 12) Safety technical device** – safety system, component and equipment of a facility whose objective is to prevent the occurrence of postulated accidents or mitigate its consequences. (pt-BR: *Dispositivo técnico de segurança*)
- 13) Sealed radioactive source** – radioactive source tightly closed in a capsule, or fully linked to inactive involving material, so that there can be no dispersion of the radioactive substance under normal or severe uses. (pt-BR: *Fonte radioativa selada*)
- 14) Secondary barrier** - barrier utilized to reduce the leakage and scattered radiation. (pt-BR: *Barreira secundária*)
- 15) Secondary system** - in a reactor, it is composed by the steam generator piping, turbine, condenser and associated piping, pumps and heaters used to convert thermal energy of the reactor cooling system into mechanical energy for electricity generation. It is most commonly used for pressurized water reactors. (pt-BR: *Sistema secundário*)
- 16) Sectional execution organization** – federal, state, municipal and private organizations that execute projects and activities of the Brazilian Nuclear Program. (pt-BR: *Órgão de execução seccional*)
- 17) Security area** - bounded area for physical protection purposes of one or more facilities having protection degrees according to the nature of the area, namely, surveyed, protected or vital area. (pt-BR: *Área de segurança*)
- 18) Security force** - equipped and trained personnel to ensure the physical protection of a facility and respond to emergency situations. In vital areas the security force must acts obligatorily under the guidance of the operation personnel; in protected and vital areas the security force must employ only its own guards, as it is forbidden hiring private companies for this purpose. (pt-BR:
-

---

*Força de segurança)*

- 19) Segregation** – process of separating or keeping apart the radioactive from non-radioactive wastes, according to radiological, chemical and/or physical characteristics, aiming to reduce the volume of radioactive waste generated as well as to facilitate its handling and subsequent treatment. (pt-BR: *Segregação*)
- 20) Self-shielded irradiator** – irradiator in which the radioactive source is completely inside a dry container, permanently shielded, to which it is not possible the access to the radioactive source and to the material under irradiation. (pt-BR: *Irradiador autoblindado*)
- 21) Semi-annual Report on Wastes and Release of Effluents** - operational routine report on the semester just ended and covering plant data on: generation, shipping and storage of waste and burned fuel element; release of liquid, gaseous and particulate effluents; effective dose equivalent in the critical group; and meteorological and atmospheric dispersion and deposition. (pt-BR: *Relatório Semestral de Rejeitos e de Liberação de Efluentes (RRE)*)
- 22) Severity** - consequence of a failure mode, considering the worst potential scenario, determined by the injury degree and damage to property or system. (pt-BR: *Severidade*)
- 23) Shielded facility** – facility of industrial radiography where the storage and use of radiation sources are held inside special closed places, provided with permanent shielding specially designed for its functions. (pt-BR: *Instalação fechada*)
- 24) Shielding** - material or device interposed between radiation sources and people or the environment for external exposure reduction. (pt-BR: *Blindagem*)
- 25) Shipper** - any person or entity so named in the regulatory documents with which it presents a shipment for transportation. (pt-BR: *Expedidor*)
- 26) Short half-life waste** - radioactive waste containing radionuclide of half-life of approximately 30 years or less. (pt-BR: *Rejeito de meia-vida curta*)
- 27) Shutting-down report** – report issued after each shutting-down of the plant, covering the planned activities and those undertaken during this period, as well as its preparation and
-

---

acquired experience. (pt-BR: *Relatório de Parada (RP)*)

- 28) Simple failure (or unique failure)** – event that results in loss of capability of a system component in performing the safety functions for which it was designed. Simple failure includes the subsequent failures it caused. (pt-BR: *Falha simples (ou falha única)*)
- 29) Site approval** - act by which CNEN approves a site for the construction of a particular plant. (pt-BR: *Aprovação do local*)
- 30) Site evaluation** - analysis of the factors in a place that could affect the safety features of the facility or activity (namely, extreme natural phenomena, human-induced accidents) as well as the radiological impact on the site in the case of radioactive release, taking into account the geophysical, demographical and infra structural aspects of the site. (pt-BR: *Avaliação do local*)
- 31) Source material** – natural uranium; uranium whose  $^{235}\text{U}$  isotope content is lower than that found in nature; thorium; any of the materials mentioned above in the form of metal, alloy, chemical compound or concentrate; any other material containing one or more of the mentioned materials in concentration to be established by CNEN; and any other material which will subsequently be considered by CNEN as source material. (pt-BR: *Material fértil*)
- 32) Special approval for transport (or special arrangement)** - act by which CNEN authorizes the transport of loading or packages containing radioactive material that do not conform to all the applicable regulatory requirements. For international transport of such kind it is necessary a multilateral approval. (pt-BR: *Aprovação especial de transporte (ou de arranjo especial)*)
- 33) Special fissionable material** -  $\text{Pu}^{239}$ ;  $\text{U}^{233}$ ; enriched uranium in the  $^{235}\text{U}$  or  $^{233}\text{U}$  isotopes; any material containing one or more of the foregoing; such other fissionable material that will subsequently be classified as special fissionable material by CNEN. However, the term “special fissionable material” does not apply to source material. (pt-BR: *Material fissil especial*)
- 34) Specific activity** - activity of a radionuclide per its mass unit. In the case of a material in which the radionuclide is uniformly distributed, it is the activity per mass unit of the material. See
-

---

Annex on Quantities and Units. (pt-BR: *Atividade específica*)

- 35) Specified equipment** - equipment especially designed or prepared for processing, use or production of nuclear material or specified material. (pt-BR: *Equipamento especificado*)
- 36) Specified material** – material especially prepared for processing, using or producing nuclear material. (pt-BR: *Material especificado*)
- 37) Spent fuel element** – fuel element that once exposed to radiation, inside a nuclear reactor, contains a significant quantity of fission products. (pt-BR: *Elemento combustível usado*)
- 38) Spent nuclear fuel** – nuclear fuel used in a nuclear reactor, removed from the core and stored in an appropriate place for future reutilization or reprocessing. (pt-BR: *Combustível nuclear usado*)
- 39) Station Fire Brigade (or simply Station Brigade)** - group with intensive training on Fire Protection, headquartered at the Nuclear Station and ready to take action in all its areas at any time. (pt-BR: *Brigada de incêndio da central (ou simplesmente Brigada da central)*)
- 40) Sterile mineral** – substances of mineral deposits but without economic value. (pt-BR: *Mineral estéril*)
- 41) Stochastic effect** - effect for which there is no necessary dose threshold for its occurrence and whose probability is a function of the dose. The severity of this effect does not depend on the dose. (pt-BR: *Efeito estocástico*)
- 42) Storage of radioactive material or radioactive waste** - confinement of radioactive material or radioactive waste for a certain period of time. (pt-BR: *Armazenamento de material radioativo ou de rejeitos radioativos*)
- 43) Structural stability** - ability of the product or package to maintain their physical integrity over time. (pt-BR: *Estabilidade estrutural*)
- 44) Subcritical mass** - insufficient mass of fissile material, or inappropriate geometric configuration to sustain a chain reaction. (pt-BR: *Massa subcrítica*)
-

- 
- 45) Sub-product (or residues)** - (1) Any radioactive material produced (except especial nuclear material), or material rendered radioactive due to incident radiation exposure during a production process or use of especial nuclear material (as in a reactor); or (2) residues generated by uranium or thorium extraction from the ore. (pt-BR: *Subproduto*)
- 46) Supervised area** – area for which occupational exposure conditions are kept under supervision, even if specific protection and safety measures are not usually required. (pt-BR: *Área supervisionada*)
- 47) Support force** – The Great Unity, the Unity or Organization of the Military Forces or Military Organization of the Auxiliary Forces, previously designated to support, within their area of competence, a specific facility under emergency situation. (pt-BR: *Força de apoio*)
- 48) Surveillance** - continuous observation performed by individuals, animals or electrical, electromechanical or electronic devices. (pt-BR: *Vigilância*)
- 49) Surveillance equipment** – equipment that registers the movement of nuclear material or the tampering of containment devices. (pt-BR: *Equipamento de vigilância*)
- 50) Surveyed area** – security area outside and adjacent to one or more protected areas, kept under constant surveillance, fenced and marked with appropriate signals which indicate that the place is a security area with controlled access. (pt-BR: *Área vigiada*)
- 

T

- 
- 01) Technical modification** – any change to the plant items for which CNEN had already issued the construction license or authorization for initial or permanent operation and that involves non evaluated safety issues. (pt-BR: *Alteração técnica*)
-

- 02) Technical specifications** – set of regulations approved by CNEN, when authorizing the initial operation, which sets limits for parameters, functioning capability and performance levels of equipments and personnel for safe operation of nuclear facilities. (pt-BR: *Especificações técnicas*)
- 03) Teletherapy** – radiotherapy with large distances between the radiation source and the patient compared with the dimensions of the irradiated tissue under treatment. (pt-BR: *Teleterapia*)
- 04) Temporary deposit** - deposit for receiving radioactive wastes only during emergencies caused by nuclear or radiological accident. (pt-BR: *Depósito provisório*)
- 05) Test nuclear reactor** – nuclear reactor designed specifically for testing the behaviour of materials and components submitted to ionizing radiation and temperature conditions as those of power reactors. (pt-BR: *Reator nuclear de teste*)
- 06) Test source** - radiation source used for the calibration of measuring devices of ionizing radiation. (pt-BR: *Fonte-teste*)
- 07) Thermal-hydraulic and Nuclear Design Report** - report containing the thermal-hydraulic and nuclear design together with its respective safety analysis corresponding to each reactor core configuration. (pt-BR: *Relatório do Projeto Nuclear e Termohidráulico (RPNT)*)
- 08) Threat analysis** - systematic analysis to identify threats to nuclear and radiation safety and the potential to initiate a sequence of accidents. (pt-BR: *Análise de ameaças*)
- 09) Tissue simulator** - material having the same characteristics as the human tissue with respect to absorption and scattering of ionizing radiation. (pt-BR: *Simulador de tecido*)
- 10) Transient (or transitory)** – An event in which the physical parameters that characterize a process – such as temperature and/or pressure of the reactor coolant system - vary with time. Transients can be caused by: (1) poison addition or removal; (2) increase or decrease in the electric charge in the turbine generator; or (3) accident conditions. (pt-BR: *Transiente (ou transitório)*)
- 11) Transport normal approval** - act by which CNEN authorizes

---

the transport of cargo or packages containing radioactive materials, in accordance with the applicable regulatory requirements. (pt-BR: *Aprovação normal de transporte*)

- 12) Transport of radioactive material (or simply transport)** – all operations and associated conditions involved in the displacement of radioactive material. (pt-BR: *Transporte de material radioativo (ou simplesmente transporte)*)
- 13) Transport Index** - number assigned to a package, over-pack or freight container package, tank or container with radioactive material with radioactive material, or to unpackaged material LSA-I or SCO-I, to provide control over radiation exposure. (pt-BR: *Índice de Transporte (IT)*)
- 14) Type A package** - package consisting of type A packing and radioactive content subject to limited activity, and if it contains fissile material an approval by CNEN is required. (pt-BR: *Embalado tipo A*)
- 15) Type A packing** – packing designed to withstand the transport in normal conditions, with the required retention degree of containment and shielding, after being properly tested. (pt-BR: *Embalagem tipo A*)
- 16) Type B packing** - packing designed to withstand the harmful effects of a transport accident, with the required retention degree of containment and shielding, after being properly tested. (pt-BR: *Embalagem tipo B*)
- 17) Type B (M) package** - package consisting of type B packing that requires multilateral approval of the design, and under certain circumstances of the consignment conditions, due to the fact that the design does not complies with one or more specific additional criteria for the type B(U) packages. (pt-BR: *Embalado tipo B (M)*)
- 18) Type B (U) package** - package consisting of type B packing that was designed in accordance with additional design and containment specific criteria, requires only unilateral approval of the project, as well as of any packing measures eventually necessities for heat dissipation. (pt-BR: *Embalado tipo B (U)*)
- 19) Type C package** - package consisting of type C packing and with radioactive content without pre-established activity limit, whose design is subject to unilateral approval. (pt-BR: *Embalado*)
-

---

*tipo C)*

- 20) Type C packing** - packing designed to withstand the harmful effects of a transport accident, with the required retention degree of containment and shielding, after being properly tested. (pt-BR: *Embalagem tipo C*)
- 21) Type H (M) package** - package consisting of type H packing containing non fissile or excepted fissile uranium hexafluoride that requires multilateral approval of its design. (pt-BR: *Embalado tipo H (M)*)
- 22) Type H (U) package** - package consisting of type H packing containing non fissile or excepted fissile uranium hexafluoride which only requires unilateral approval of the design. (pt-BR: *Embalado tipo H (U)*)
- 23) Type H packing** - packing designed to transport non fissile or excepted fissile uranium hexafluoride. (pt-BR: *Embalagem tipo H*)
- 



- 01) Unilateral approval** - approval of a project only by the competent authority of the country of project origin. (pt-BR: *Aprovação unilateral*)
- 02) Unusual event** – situation that takes place at the moment it is verified an initial condition that indicates a possible deterioration of the safe level of the facility. (pt-BR: *Evento não usual*)
- 03) Uranium conversion** - a set of operations required to transform the nuclear material into uranium hexafluoride. (pt-BR: *Conversão de urânio*)
- 04) Uranium hexafluoride production plant or conversion plant** - nuclear facility that covers systems, components and structures necessary to the conversion of the yellow cake in uranium hexafluoride. (pt-BR: *Usina de produção de hexafluoreto*)
-

---

*de urânio ou usina de conversão)*

- 05) Usage factor** - fraction of the working load during which the primary radiation beam is directed toward a specific target. (pt-BR: *Fator de uso*)
- 



- 
- 01) Validation** – set of activities that testify that computer programs present correct results considering the feed data. (pt-BR: *Validação*)

- 02) Very short half-life waste** - radioactive waste containing radionuclide of half-life less or about 100 days, with activity or activity concentration levels higher than the respective levels of clearance and that can comply, during a period of 5 years, with the clearance criteria. (pt-BR: *Rejeito de meia-vida muito curta (RVMC)*)

- 03) Vital area** – security area, inside a protected area, containing vital and/or category I nuclear material inside a structure whose walls, ceiling and floor constitute a physical barrier. (pt-BR: *Área vital*)

- 04) Vital equipment** – equipment, system, device or material, of a facility, whose failure, destruction, removal or release can directly or indirectly cause an emergency situation for the facility. (pt-BR: *Equipamento vital*)
-

---



---

**01) Waste Dam System** – system including the dam, foundation, jambs and the wastes reservoir. (pt-BR: *Sistema de Barragem de Rejeitos (SBR)*)

**02) Waste stabilization (or simply Stabilization)** - set of measures adopted in order to minimize in the long-term the waste erosion and leaching that may reach surface and underground waters, as well as prevent exceeding any limit applicable to radiation exposure. (pt-BR: *Estabilização de rejeitos (ou simplesmente Estabilização)*)

---

---



---

**01) X-ray machine workload** – totality of the X ray tube current during one week, usually expressed in mA.min/week. (pt-BR: *Carga de trabalho de um aparelho de raios X*)

---

---



---

**01) Yellow cake** - Ammonium diuranate or other product resulting from the extraction of uranium, having bright yellow color. This material is packed in barrels and sent to a conversion plant for uranium hexafluoride production (UF<sub>6</sub>), as a stage of the nuclear

---

---

fuel production. (pt-BR: "Yellow cake")

---

---

Z

---

**5 - Acronyms**

<b>ABACC</b>	Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials
<b>AIO</b>	Authorization for Initial Operation
<b>ALARA</b>	As Low As Reasonably Achievable
<b>AOC</b>	Authorization for Commissioning
<b>AOR</b>	Annual Operating Report
<b>APO</b>	Authorization for Permanent Operation
<b>AUMAN</b>	Authorization for Use of Nuclear Material
<b>BWR</b>	Boiling Water Reactor
<b>CNAAA</b>	Almirante Álvaro Alberto Nuclear Power Station
<b>CNEN</b>	National Nuclear Energy Commission
<b>DRS</b>	Radiation Protection and Nuclear Safety Directorate
<b>EPZ</b>	Emergency Planning Zone
<b>Euratom</b>	European Atomic Energy Community
<b>FP</b>	Fire Protection
<b>FPP</b>	Fire Protection Plan
<b>FSAR</b>	Final Safety Analysis Report
<b>GDC</b>	General Design Criteria
<b>IAEA</b>	International Atomic Energy Agency
<b>ICRP</b>	International Commission on Radiological Protection

<b>INES</b>	International Nuclear Event Scale
<b>INMETRO</b>	National Institute of Metrology and Industrial Quality
<b>IOR</b>	Initial Operations Report
<b>IRD</b>	<u>Dosimetry and Radioprotection Institute</u>
<b>ITSB</b>	Independent Technical Supervising Body
<b>LEP</b>	Local Emergency Plan
<b>LNMRI</b>	National Laboratory for Ionizing Radiation Metrology
<b>LOCA</b>	Loss of Coolant Accident
<b>LSA</b>	Low Specific Activity
<b>MPA</b>	Maximum Postulated Accident
<b>MPF</b>	Maximum Permissible Flooding
<b>MUF</b>	Material Unaccounted For
<b>NDT</b>	Non-Destructive Test
<b>NRC</b>	Nuclear Regulatory Commission
<b>NTHDR</b>	Nuclear and Thermal-Hydraulic Design Report
<b>OEI</b>	Occupationally Exposed Individual
<b>OMR</b>	Operation Monthly Report
<b>OOR</b>	Obligatory Occurrence Reporting
<b>PFPP</b>	Preliminary Fire Protection Plan
<b>PNB</b>	Brazilian Nuclear Program
<b>PP</b>	Physical Protection
<b>PPP</b>	Physical Protection Plan

<b>PSAR</b>	Preliminary Safety Analysis Report
<b>PWR</b>	Pressurized Water Reactor
<b>QAP</b>	Quality Assurance Program
<b>QAS</b>	Quality Assurance System
<b>RP</b>	Radioprotection Plan
<b>SAR</b>	Safety Analysis Report
<b>SARAC</b>	Safety Analysis Report Approval Certificate
<b>SCO</b>	Surface Contaminated Object
<b>SIPRON</b>	Brazilian Nuclear Program's Protection System
<b>TI</b>	Transportation Index
<b>WDS</b>	Wastes Dam System
<b>WERSR</b>	Wastes and Effluents Release Semi-annual Report

6 - Appendices: Quantities and Units of Ionizing Radiation

Source: Adapted from LNMRI/IRD – December, 2002.

Table 1: Radioactivity Quantities

QUANTITY	SYMB.	UNIT	DEFINITION
Activity	A	Becquerel $Bq = s^{-1}$	It is the $dN / dt$ ratio of a quantity of radioactive nuclei, in a particular energy state, where $dN$ is the expected value of the number of spontaneous nuclear transitions, of this energy state, in the time interval $dt$ .  $A = dN / dt$
Internal conversion coefficient	$\alpha$	-	It is the ratio between the probability of conversion electrons emission and the probability of total gamma emission from a nucleus, in a certain energy state or in one of its excited states.  $\alpha = \lambda_e / \lambda_\gamma$  As the ejected electrons may belong to the K, L, M, etc. layer, the conversion coefficient is equal to:  $\alpha = \alpha_K + \alpha_L + \alpha_M + \dots$
Decay Constant	$\lambda$	$s^{-1}$	It is the quotient of $dP$ by $dt$ , where $dP$ is the probability of a given nucleus undergoing spontaneous nuclear transition from a given energy state in the time interval $dt$ . It is also called disintegration constant  $\lambda = dP / dt$
Partial Decay Constant	$\lambda_\alpha$ $\lambda_\beta$	$s^{-1}$ $h^{-1}$ $a^{-1}$	It is the probability of one radionuclide in a given energy state, to decay per time unit, by alpha emission, beta emission or other decay mode, such as electron capture or spontaneous fission.  $\lambda = \lambda_\alpha + \lambda_\beta + \dots$
Air kerma rate constant	$\Gamma_\delta$	$m^2 Gy Bq^{-1} s^{-1}$	It is the quotient of $I \dot{K}_\delta$ by A, where $\dot{K}_\delta$ is the kerma rate in the air due to photons with energy greater than $\delta$ , at a distance $I$ from a radionuclide point source of activity A.  $\Gamma_\delta = I^2 \dot{K}_\delta / A$
Half-life	$T_{1/2}$	s h a	It is the time interval required for the initial number of radioactive nuclei in a sample, in a particular energy state, to be reduced to half of its initial value.  $T_{1/2} = \ln 2 / \lambda$

<b>Transition probability</b>	$P_{\alpha}$ $P_{\beta}$ $P_{\gamma}$	$s^{-1}$	It is the emission probability per unit time, of alpha, beta or gamma radiation, of a given excited nuclear state
<b>Mean lifetime</b>	$\tau$	s h a	It is the weighted average of lifetimes or life expectancy of each radionuclide of the sample. Corresponds to the time required for the number of radioactive nuclei in a sample to decrease by a factor $1/e$ . $\tau = 1/\lambda = T_{1/2} / \ln 2$

**Table 2: Radiometric Quantities**

QUANTITY	SYMB.	UNIT	DEFINITION
<b>Fluence</b>	$\Phi$	$m^{-2}$	It is the quotient of $dN$ , the number of particles incident on a sphere with $da$ cross-section area, by $da$ , $\Phi = dN / da$

Table 3: Coefficients of Interaction

QUANTITY	SYMB.	UNIT	DEFINITION
Average energy required to form an ions pair in a gas	W	J	<p>It is the quotient of E by N, where N is the average number of pairs of ions formed when a charged particle of kinetic energy E is completely dissipated in the gas.</p> $W = E / N$ <p>Its value is usually expressed divided by the electron charge e. For air, W/e is: 33.97 J C<sup>-1</sup></p>
Mass total stopping power	S/ρ	J m <sup>2</sup> kg <sup>-1</sup>	<p>It is the quotient of dE by ρ. dl, where dE is the energy lost by charged particle in traversing a distance dl in the material of density ρ, for charged particles of a given type and energy.</p> $S/\rho = (1 / \rho). (dE / dl)$
Radiation chemical yield	G	mol J <sup>-1</sup>	<p>It is the quotient of n (x) by ε, where n (x) is the average amount of the substance x produced, destroyed or modified by the deposited energy by radiation ε in matter.</p> $G (x) = n (x) / \epsilon$
Cross section	σ	m <sup>2</sup>	<p>It is the quotient of P by Φ, where P is the probability of interaction for the target when subjected to a flow Φ of charged or neutral incident particle, of a particular type and energy, on the target in order to produce a given interaction.</p> $\sigma = P / \Phi$
Linear energy transfer (LET)	L <sub>Δ</sub>	J m <sup>-1</sup>	<p>It is the quotient of dE by dl, where dE is the energy lost by the charged particle due to collisions with electrons when crossing the distance dl, less the sum of the kinetic energies of all electrons lost with kinetic energies above Δ</p> $L_{\Delta} = [dE / dl]_{\Delta}$ <p>The LET is also called restricted collision stopping power.</p>

Table 4: Dosimetric quantities

QUANTITY	SYMB.	UNIT	DEFINITION
Absorbed dose	D	Gray Gy = J kg <sup>-1</sup>	It is the quotient of $\overline{d\epsilon}$ by $\overline{dm}$ , where $\overline{d\epsilon}$ is the mean energy deposited by ionizing radiation in a matter of mass $\overline{dm}$ at a point of interest. $D = \overline{d\epsilon} / \overline{DM}$
Exposure	X	C kg <sup>-1</sup>	It is the quotient of $dQ$ by $dm$ where $dQ$ is the absolute value of the total ions charge of a given signal, produced in air, when all electrons (negative and positive) released by photons in air, in a mass $dm$ , are completely stopped in the air. $X = dQ / dm$
Kerma	K	Gray Gy = J kg <sup>-1</sup>	It is the of $dE_{tr}$ by $dm$ , where $dE_{tr}$ is the sum of the initial kinetic energies of all charged particles liberated by uncharged particles or photons, reaching a material of mass $dm$ . $K = dE_{tr} / dm$

Table 5: Limiting Quantities Used in Radiological Protection for External Radiation

QUANTITY	SYMB.	UNIT	DEFINITION
Effective dose	E	Sievert Sv = J kg <sup>-1</sup>	It is the weighted summation equivalent doses in all tissues or organs of the body: $E = \sum T W_T . H_T$ where $W_T$ is the weighting factor for tissue T and $H_T$ is the equivalent dose for tissue T.
Equivalent dose	H <sub>T</sub>	Sievert Sv = J kg <sup>-1</sup>	It is the average absorbed dose $D_T, R$ in a tissue or organ T, obtained on all the tissue or organ T, due to radiation R: $H_T, = \sum R W_R . D_T. R$ where $W_R$ is the weighting factor of R radiation.

**Table 6: Operational Quantities for Radiation Protection (ICRU 47 and 51)**

QUANTITY	SYMB.	UNIT	DEFINITION
<b>Ambient dose equivalent</b>	$H^*(d)$	Sievert $Sv = J\ kg^{-1}$	It is the dose equivalent that would be produced by the corresponding aligned and expanded field in the ICRU sphere at a depth $d$ on the radius opposing the direction of the aligned field. Defined at a point in a radiation field. Used as a directly measurable proxy for effective dose for use in monitoring of external exposure. The recommended value of $d$ for strongly penetrating radiation is 10 mm.
<b>Directional dose equivalent</b>	$H'(d, \Omega)$	Sievert $Sv = J\ kg^{-1}$	It is the dose equivalent that would be produced by the corresponding expanded field in the ICRU sphere at a depth $d$ on a radius in a specified direction $\Omega$ . Defined at a point in a radiation field. Used as a directly measurable proxy for equivalent dose in the skin for use in monitoring of external exposure. The recommended value of $d$ for weakly penetrating radiation is 0.07 mm.
<b>Personal dose equivalent</b>	$H_p(d)$	Sievert $Sv = J\ kg^{-1}$	It is the dose equivalent in soft tissue at a depth $d$ below a specified point on the body.

**Table 7: Radiation Protection Magnitude for Internal Dosimetry**

QUANTITY	SYMB.	UNIT	DEFINITION
<b>Committed absorbed dose</b>	$D$	Gray $Gy = J\ kg^{-1}$	Is the value of the absorbed dose rate integral, in a particular tissue or organ, which will be received by an individual, after radioactive material intake in his body, for a time interval $\tau$ after the intake. $D(\tau) = \int_{t_0}^{t_0 + \tau} (dD(t) / dt) \cdot dt$