

SMALL REACTORS WITHOUT ON-SITE REFUELLING

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1. Licensing Regulations.

1.1. Preliminary Remarks

In Brazil, the attribution to legislate all matters concerning nuclear activities belongs solely to the Union, as established by the Federal Constitution;

Federal Constitution - Article 22
The Union holds exclusively the competence to legislate over :
XXVI – nuclear activities of any nature;

However, the application of this principle as far as a licensing process is concerned, runs into several controversies, since the licensing of nuclear activities must be conducted both by the National Commission of Nuclear Energy – **CNEN**, the Nuclear Regulatory Authority, and by the Brazilian Institute for Environment and Natural Renewable Resources – **IBAMA**, concerning Environmental Licensing.

In the specific case of nuclear power plants, there is the additional need to submit the Plant Design to The National Agency for Electrical Energy – **ANEEL**, and, later on, the Operation License – LO granted by **IBAMA**, in order to obtain the status of a plant in operation. Until then, the plant is considered to be under tests.

1.2. Basic Legislation

The nuclear and environmental licensing are basically regulated by::

- Norm **CNEN** NN 1.04 Licensing of Nuclear Plants
- Resolution **CONAMA** 237/97 Environmental Licensing, issued by the National Council for Environment.

1.2.1. Licensing of Nuclear Plants

The aim of this norm is to regulate the licensing of nuclear installations, in charge of **CNEN**.

The process established by this norm applies to activities related to the siting, construction and operation of nuclear plants, comprising the following steps:

- Site approval;
- Construction License;
- Authorization for the use of nuclear material ;
- Authorization for the start of operation;

- Authorization for permanent operation;
- Cancelling of operation authorization.

The several steps of nuclear licensing must be supported by the Site Report, the Preliminary Safety Analysis Report, the Physical Protection Plan and the Final Safety Analysis Report.

In the specific case of this report, the following normative text must be pointed out:

8.5 EMERGENCY PLAN.

The Local Emergency Plan, comprising the initial and permanent operation, must demonstrate that, if an emergency situation involving radiation occurs, adequate measures will be taken in order to guarantee public health and safety and to avoid damage to property. This plan must be elaborated in accordance with the guidelines contained in papers issued by the International Atomic Energy Agency - IAEA

Information must be included, but not restricted to, as described in items 8.5.1 to 8.5.12.

8.5.1 ***The organizational structure capable of facing the emergency, with definition of authorities, responsibilities and specific tasks, as well as the information infrastructure to notify people, local, state and federal involved organizations.***

8.5.2 ***Indication of positions or functions with description of qualification for:***

a) other employees of the company responsible for operation with special qualification to give assistance under the emergency conditions;

b) other persons with special qualification, not belonging to the operation company, who might be called to render assistance.

8.5.3 ***The means to verify the magnitude of abnormal release of radioactive material, including criteria to determine the need to notify CNEN and other local, state and federal organizations, as well as procedures to adopt the local protective measures, in order to guarantee the health and safety of the public and avoid damages to property.***

8.5.4 ***Agreements signed together with local, state or federal authorities for prompt notification and evacuation of the public, or for other required or desirable protective measures, including identification of main authorities, by title and organization, as foreseen in the norms from the Protection System for the Brazilian Nuclear Programme – SIPRON.***

8.5.5 *Procedures to rehearse, through periodical exercises, the plans for emergencies with radiation, to ensure that the plant employees, during the operation phase, are familiar with their specific tasks, and procedures to allow other persons, whose assistance might be required in case of emergency, to participate in the exercises*

8.5.6 *Procedures to maintain updated the service organization and all procedures in case of emergencies, as well as lists of specially qualified people to face emergencies.*

8.5.7 *Description of installations for first aid and decontamination of persons, including:*

c) local equipment for monitoring persons;

d) local facilities and equipment for decontaminating persons;

e) local facilities and medical equipment for adequate emergency and first aid treatment;

f) medical services or from other persons qualified to act in cases of emergency exposure;

g) services for the transportation of wounded or contaminated persons, for treatment in external hospitals.

8.5.8 *Procedures for treatment of persons in external hospital facilities.*

8.5.9 *Procedures for training of employees from the operation organization, to whom specific authority and responsibility has been attributed in case of emergency, and of other people whose assistance might be necessary.*

8.5.10 *Criteria to apply in order to determine, after an accident, the convenience of reentering the plant or the restart of operation.*

8.5.11 *Description of the equipment for collecting meteorological and hydrological data on site and of the equipment required to transmit these data to CNEN.*

8.5.12 *Description of the technical support center, its operation and interaction with the technical team from CNEN, including the foreseen means to transmit technical data from the plant necessary to be evaluated by CNEN.*

1.2.2. Environmental Licensing

Taking into account that the environmental licensing lies within federal authority, the basic pertinent legislation establishes the following:

I - Environmental Licensing: administrative procedure by which the competent environmental organization licenses the siting, the installation, the enlargement and the operation of enterprises and activities which employ environmental resources, considered effectively or potentially polluting, or those which, under any circumstance can cause environmental degradation, considering the applicable legal and regulatory dispositions as well as technical norms.

(...)

Art. 4 - The competence to grant an environmental license to enterprises and activities with significative environmental impact, in national or regional sphere, as referred by article 10 in law nr.6938, from August 31, 1981, lies with the Brazilian Institute of Environment – IBAMA, the executive organization of the National System of Environment – SISNAMA, as follows:

(....)

IV – destined to research, mine, produce, transform, transport, store and dispose of radioactive material, in any stage or that use nuclear energy in any of its forms or applications, according to judgement provided by the National Commission of Nuclear Energy – CNEN.

Based in this normative instrument, the competent public organism will issue the following licenses:

- Previous License – LP;
- Installation License – LI ; Operation License – LO.

To request the above mentioned licenses, the entrepreneur must present an Environmental Study according with the Reference Term to be presented by the licensing Authority. Licensing Study is defined in this normative instrument as follows :

III – Environmental Studies: are all and any studies referred to environmental aspects and related to siting, installation, operation and enlargement of an activity or enterprise, presented as a subsidy for the analysis of the required license, such as: environmental report, plan and project for environmental monitoring, preliminary environmental report, environmental diagnosis, managerial plan, plan for recuperation a degraded area and preliminary risk analysis.

1.2.3. Specific Regulation for the Nuclear Sector

In 1980, by Law Decree nr. 1809/80, and regulated by Decree nr. 2210/97, the Protection System for the Brazilian Nuclear Programme – **SIPRON** was created with the purpose of ensuring the planning, coordination and execution of integrated and continual actions and measures.

SIPRON is a group of federal, state and municipal organizations and of public and private companies, which act in a systemic way under the coordination of the Ministry of Science and Technology.

SIPRON can act in the occurrence of radiological accidents, complementing the activities of States, Regions and all involved organisms in neutralizing the emergency situation and reestablishing the normality in the affected areas.

Its structure is shown, in its different levels, in figure 1.

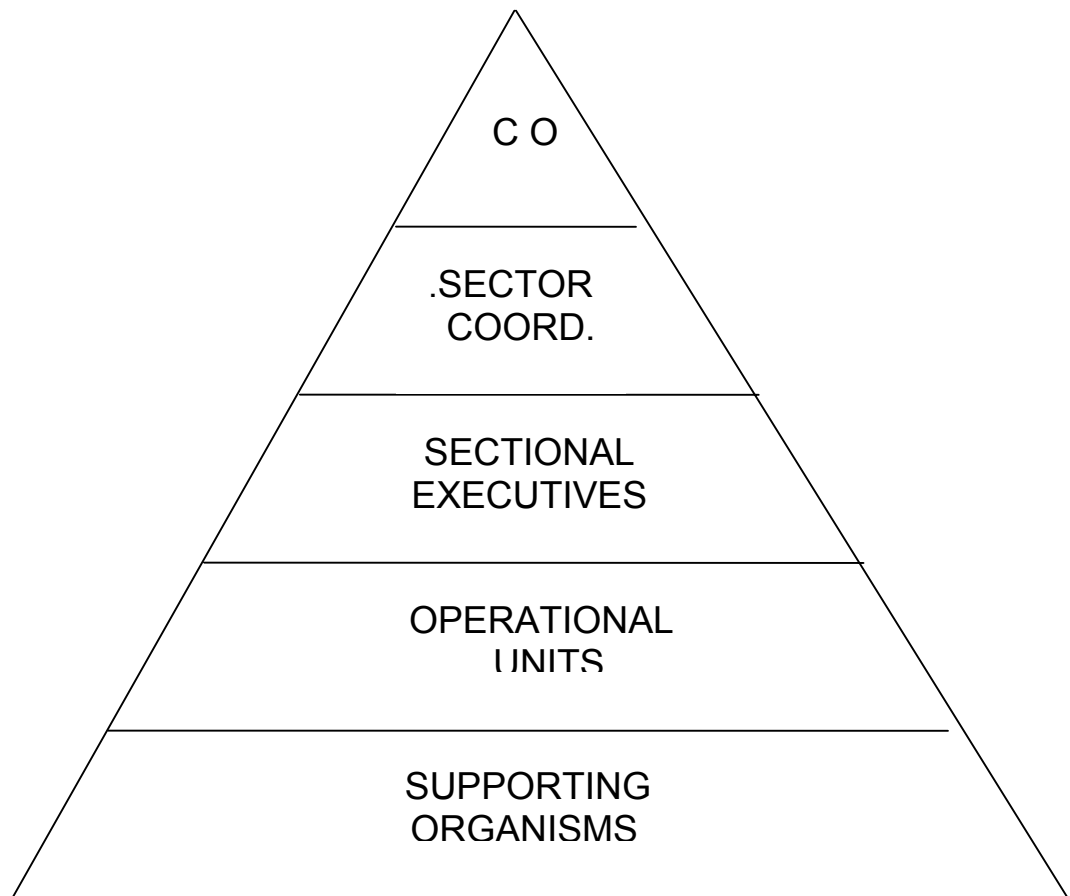


figure 1

◆ **C O – CENTRAL ORGANISM** is the Ministry of Science and Technology – **MCT**, and receives the support from the Coordinating Commission of Protection to the Brazilian Nuclear Programme – **COPRON**, having the following responsibilities:

- Overall orientation;
- General coordination;
- Control;
- Supervision.

Mission of the Coordinating Commission of Protection for the Brazilian Nuclear Programme – **COPRON**

Assist the Central Organism – C O in studies and planning activities, through:

- consulting and interpreting;
- General Rules and Guidelines;
- passing sentences / opinions;
- projects to update legislation.

Structure of **COPRON**:

Integrated by representatives of the Federal Public Administration and of State-owned Companies related to the nuclear area:

- **MCT** – Ministry of Science and Technology
- **MS** - Ministry of Health
- **MME** – Ministry of Mines and Energy
- **MMA** – Ministry of Environment
- **FUNDACENTRO / MTE** - Ministry of Labour and Employment
- **SEDEC/MI** – National Secretary for Civil Defense/Ministry of National Integration
- **ABIN/GSI/PR** - Brazilian Intelligence Agency / Presidency of the Republic
- **CNEN** – National Commission of Nuclear Energy / MCT
- **ELETRONUCLEAR** – Holding company of the Electrical sector / MME
- **INB** – Responsible for the front end fuel cycle / MCT
- **ELETRONUCLEAR** – Construction and operation of nuclear power plants

COPRON is supported, for the external response to emergency situations in nuclear power plants, by a Planning Committee for Response to Nuclear Energy Situations – **COPREN/AR**, located in Angra dos Reis, site of the existing NPPs in Brazil.

Structure of **COPREN/AR**

Integrated by three levels of Public Administration and by State-owned companies related to the nuclear sector.

- **MCT**
- **SEDEC/MI**
- **ABIN/GSI/PR**
- **CNEN**
- **ELETRONUCLEAR**
- **DGDEC** – General Department / State Secretary for Civil Defense
- **10 ° GBM** – Military Fire Brigade

- **FEEMA** – State Foundation of Engineering for the Environment
- **SEMDEC/AR** – Secretary for Civil Defense in the region of Angra dos Reis

◆ **SECTOR COORDINATION** is composed by the following entities:

- **CNEN/MCT**
- **DSST /MTE** - Department of Health and Safety in Labour
- **SEDEC/MI**
- **IBAMA/MMA**
- **ABIN/GSI/PR**

◆ **SECTIONAL EXECUTIVES** are the following companies:

- **INB** - Indústrias Nucleares do Brasil S.A.
- **ELETROBRAS** – Empresas Elétricas Brasileiras S.A.
- **ELETRONUCLEAR** - Eletrobras Termanuclear S.A.
- Research and Teaching organizations related to the Brazilian Nuclear Programme

◆ **OPERATIONAL UNITS** are characterized by:

- Power Reactors: **ELETRONUCLEAR**
- Fuel Cycle Installations: **INB** and **CTMSP** – Naval Research Center.
- Research and Teaching organizations related to the Brazilian Nuclear Programme
- Research Institutes belonging to **CNEN**: **CDTN**, **IPEN**, **IEN**, **IRD**
- Military Research Institutes: **CTMSP**, **CTEx**, **CTA**
- Transportation Units

◆ **SUPPORTING ORGANISMS** for **SIPRON** are::

- Ministry of Justice
- Ministry of Defense
- Ministry of Foreign Relations
- Ministry of Finances
- Ministry of Transports
- Ministry of Health
- Ministry of Planning, Budgeting and Administration
- Ministry of Communication
- State and Municipal Governments
- Private Companies and Organisms related to Project Safety or activities in the Brazilian Nuclear Programme

◆ **SIPRON** is supported by the following legislation:

Federal Laws

- Law Decree DL N° 1.809 / 80 - constitutes **SIPRON**
- Decree Dec.N° 2.210 / 97- Regulates DL 1.809.

Ministerial Decrees and Norms for SIPRON

NG 01 – Functioning of **COPRON**

NG 02 – Planning the Answer for a Situation of Nuclear Emergency

NG 03 – Physical Integrity of Nuclear Installations

NG 04 – Emergency Situations in Transport Units

NG 05 – Information Campaigns

NG 06 – Functioning of Emergency Centers

NG 07 – Planning for Communications

NG 08 – Protection for Confidential Knowledge

NI 01 – Installation and functioning of **CNAGEN**

Guideline Angra 1 – Elaboration of Emergency Plans for Unit 1 of **CNAAA**

Decree N° 777, October 30, 2003 – Creates **COPREN/AR**

Decree N° 68, February 18, 2005 – Creates **COPREN/RES**

NG – 09 – Revision and Updating of Emergency Plans for **CNAAA** – (substitutes Guideline Angra 1)

1.3. Emergency Planning

Due to the normative regulations already mentioned, the Emergency Planning considers several levels of administration and actions. For its implementation, the Emergency Planning for Nuclear Power Plant Almirante Alvaro Alberto – **CNAA**, Angra 1 and Angra 2, is subdivided in two plans. The Local Emergency Plan – **PEL**, administrated by **ELETRONUCLEAR**, and the External Emergency Plan – **PEE**, under the responsibility of the Secretary for Civil Defense in the State of Rio de Janeiro.

1.3.1. Technical Basis

The Process for Nuclear Licensing is based on the Final Safety Analysis Report-FSAR. For the elaboration of the Emergency Plans, the Design Basis Accidents are taken into account, as described in the specific chapter.

For accidents beyond design basis, the WASH-1400 report and the Three Mile Island accident will be considered.

1.3.2. Emergency Planning Zone

The operation of the Emergency Plan is fundamented on the concept of Emergency Panning Zones – **ZPE**, which are concentric radii situated at the distances of 3, 5, 10 and 15 km around NPP Angra 1.

1.3.3. Emergency Classes

Depending on the events during an emergency situation, the planning of actions is divided in four classes:

- Unusual Event
- Alert
- Área Emergency
- General Emergency

1.3.4. Emergency Measures

- Notify the population
- Sheltering
- Evacuation
- Skin Protection
- Breathing Protection
- Water and Food Control
- Descontamination of persons/pessoas
- Medical Care
- Descontamination of Areas
- Access Control
- Temporary Removal
- Resettling
- Return of the Population

1.3. ELETRONUCLEAR

ELETRONUCLEAR has the responsibility to implement the Local Emergency Plan – **PEL**, which accounts for the measures to be taken within the area of its property.- **(APE)**. The company must also give assistance to the other parties in **ZPE 3** and **5**, and must initiate the communication of emergency, according to the classification of events within the emergency classes.

- Unusual Event: when an initial condition occurs that might indicate a possible degrading of the safety level in the plant;
- Alert: condition that indicates a real or probable degrading in the plant's safety level;
- Area Emergency: indication of a real failure in the plant's safety level and the prevision or evidence that there has been, or there will be, non programmed release of radioactive material;
- General Emergency: real or possible release of radioactive material to the environment.

2. How the regulations will affect an additional unit

This applies in Brazil for the licensing of Angra 3, located in the same site as units 1 and 2, which are in operation, and of similar design as Angra 2..

a) Regulations which will be applied using Angra 2 as a Reference Plant.

All applicable legislation for organizing the emergency plan for **CNAAB** remains unaltered for the implementation of the third unit.

The use of Angra 2 as reference for Angra 3, as well as the use of the existing Environmental and Nuclear Licensing will not require any changes in the applicable legislation.

The location of the additional unit in the **CNAAA**, will not alter conceptually the emergency plan, demanding only a change in the configuration of the Emergency Planning Zones (**ZPE**).

b) Further requirements, including those for licensing a new site

Implementing new nuclear installations outside of **CNAAA**'s site, will not demand the application of new requirements, other than those foreseen in the applicable legislation, as already mentioned in this report.

The requisites to be included in the studies related to site selection, both in the Site Report for **CNEN**, and in the Study of Environmental Impact – Report on Impact to the Environment (**EIA – RIMA**) for **IBAMA** must consider the variables related to the Emergency Planning for the installation.

Among those, we have to consider:

- Site physical and biological characteristics
- Social and economical data
- Characteristics of the installations
- Use of the soil
- Protected areas
- Cultural and archeological patrimony
- Risk analysis
- Map of environmental sensibility.

3.Changes that could be necessary if the emergency planning is eliminated or reduced

a) Identify criteria based on technical / quantitative parameters that can lead to reduced emergency planning.

- Increase the guarantee of containment's integrity in order to ensure the confinement of fission products in case of an accident;
- Reduce the risk of occurring accidents;
- Availability of safety systems;
- Redundancy,

b) Identify changes that can be applied to licensing procedure due to reduced emergency planning.

In principle there will not be any major changes in the legislation related to emergency planning, since there would still be the need of a plan

As a consequence of the increase in safety, there will be a reduction in the complexity of the emergency planning, that will be basically noticed when avoiding

the removal of a large population, living within the **ZPE**, resulting in a considerable cost reduction .

These great efforts developed for the safety of the nuclear power plant will immediately promote a simplification in the licensing procedure, specially in its most controversial sections, such as risk and safety analysis.

The possibility of eliminating the need of external response lies with the success, mainly by safety-by-design reactor development, in demonstrating that the accidents which would lead to an emergency situation will not occur.

As a highly positive consequence of eliminating the need of external response to emergency situations in the operation of a nuclear power plant, is its great contribution for the public acceptance of this technology used in generating electricity.