

initial operation. The preservation measures including the 24 months inspection programme continue to be applied for the Angra 3 components stored at the site.

Table 3 – Angra 3 Current Status

ESTIMATED PROGRESS	
ITEM	PROGRESS
DESIGN	Approx. 70 - 75%
IMPORTED SUPPLY	Approx. 65 - 75%
NATIONAL SUPPLY	Approx. 5%
CIVIL CONSTRUCTION	Approx. 5%
ELECTROMECHANICAL ERECTION	0%
COMMISSIONING	0%
TOTAL ENTERPRISE	30%

For the national scope of supplies, more than 50% in value is concentrated in supply contracts already signed with Brazilian companies, including condensers, heat exchangers and tanks. The general guidelines for renegotiating the contracts are established and the re-negotiation will be started immediately after plant construction decision. Contract for civil construction had already been signed in the past and the scope and commercial conditions are now being reevaluated for re-negotiation with the contractor.

Preparation of the Preliminary Safety Analysis Report (PSAR) for the Nuclear Licensing process is under way. As agreed with CNEN, the Angra 3 PSAR will be prepared based on the approved Final Safety Analysis Report of Angra 2, with the necessary adaptations.

As a critical path for restarting construction, the Environmental Impact Study will be prepared along 2001 in the frame of the Environmental Licensing Process.

Plant construction is planned for a 66 months duration, from starting of reactor annulus slab concrete work up to end of power tests and start of commercial operation. Effective restart of Angra 3 project depends on final decision of the Brazilian Government authorities, expected for the second half of 2001.

Chapter 3. LEGISLATION AND REGULATION

3.1. Article 7. Legislative and regulatory framework



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Brazil has established and maintained the necessary legislative and regulatory framework to ensure the safety of its nuclear installations. The Federal Constitution of 1988 specifies the distribution of responsibilities among the Federal Union, the States and the Municipalities with respect to the protection of the public

health and the environment, including the control of radioactive products and installations (Articles 23, 24 and 202). As mentioned in item 1.1, the Union is solely responsible for nuclear activities related to electricity generation, including regulating, licensing and controlling nuclear safety (Articles 21 and 22). In this regard, the Comissão Nacional de Energia Nuclear (Brazilian National Commission for Nuclear Energy - CNEN) is the national regulatory body, in accordance with the National Nuclear Energy Policy Act.

Furthermore, the constitutional principles regarding protection of the environment (Article 225) require that any installation which may cause significant environmental impact shall be subject to environmental impact studies that shall be made public. More specifically, for nuclear power plants, the Federal Constitution provides that the siting of the installation shall be approved by Law (Article 225, Paragraph 6). Therefore, licensing of nuclear power plants are subject to both a nuclear licence by CNEN and an environmental licence by the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute for the Environment and Renewable Natural Resources – IBAMA), with the participation of state and local environmental agencies as stated in the National Environmental Policy Act. These principles were established by the Federal Constitution of 1988, at the time that Angra 1 had already been in operation, and Angra 2 had already been under construction. Therefore, licensing procedures for these power plants followed slightly different procedures, as described below.

A recent restructuring of the Federal Government has abolished the Secretary for Strategic Affairs (SAE) and placed CNEN under the Ministry of Science and Technology (MCT).

The relation amongst regulatory organizations and operators is shown in Figure 3.

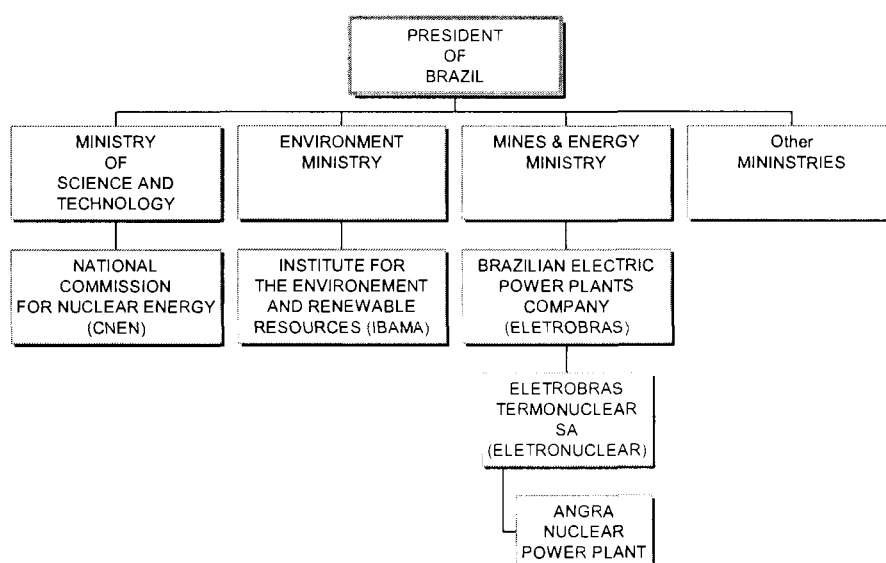


Fig. 3 – Brazilian Organizations Involved in Nuclear Power Plant Safety

3.1.1. Nuclear licensing process

CNEN was created in 1956 (Decree 40.110 of 1956.10.10) to be responsible for all nuclear activities in Brazil. Later CNEN was re-organized and its responsibilities were established by Law 4118/62 with alterations determined by Laws 6189/74 and 7781/89. Thereafter, CNEN became the Regulatory Body in charge of regulating, licensing and controlling nuclear energy. Since 2000, CNEN is now reporting to the Ministério de Ciência e Tecnologia (Ministry of Science and Technology - MCT).

CNEN responsibilities related to this Convention include, among others:

- the preparation and issuance of regulations on nuclear safety, radiation protection, radioactive waste management and physical protection;
- accounting and control of nuclear materials (safeguards);
- licensing and authorization of siting, construction, operation and decommissioning of nuclear facilities;
- regulatory inspection of nuclear reactors;
- acting as a national authority for the purpose of implementing international agreements and treaties related to nuclear safety activities;
- participating in the national preparedness for, and response to nuclear emergencies.

Under this framework, CNEN has issued radiation protection regulations and regulations for the licensing process of nuclear power plants, safety during operation, quality assurance, licensing of operational personnel and their medical certification for active duty, reporting requirements for the operational nuclear power plants, plant maintenance, and others (see Annex 2. Item 2.3 for a complete list of CNEN regulations).

The licensing regulation CNEN NE 1.04[6] establishes that no nuclear installation shall operate without a licence. It also establishes the necessary review and assessment process, including the specification of the documentation to be presented to CNEN at each phase of the licensing process. It finally establishes a system of regulatory inspections and the corresponding enforcement mechanisms to ensure that the licensing conditions are being fulfilled. The enforcement mechanisms include the authority of CNEN to modify, suspend or revoke the licence.

The licensing process is divided in several steps:

- Site Approval;
- Construction Licence;
- Authorization for Nuclear Material Utilization;
- Authorization for Initial Operation;
- Authorization for Permanent Operation;
- Authorization for Decommissioning

Federal Law 9.756 has been approved in 1998 establishing taxes and fees for each individual licensing step, as well as for the routine work of supervision of the installation by CNEN.

For the first step, site selection criteria are established in Resolution CNEN 09/69[7], taking into account design and site factors that may contribute to violation of established dose limits at the proposed exclusion area for a limiting postulated accident. Additionally, by adopting the principle of "proven technology", CNEN regulation NE 1.04 requires for site approval the adoption of a "reference plant" for the nuclear installation to be licensed.

For the construction licence, CNEN performs a detailed review and assessment of the information received from the licensee in a Preliminary Safety Analysis Report (PSAR). The construction is followed closely by a system of regulatory inspections.

For the authorization for initial operation, CNEN reviews the construction status, the commissioning programme including results of pre-operational tests, and updates its review and assessment of plant design based on the information submitted in the Final Safety Analysis Report (FSAR). At this time CNEN also licenses the reactor operators in accordance with regulation CNEN-NE-1.01[8]. Startup and power ascension tests are closely followed by CNEN inspectors, and hold points at different power levels are established.

Authorization for permanent operation, limited to a maximum of 40 years, is given after a complete review of commissioning test results and the solution of any deficiencies identified during construction and initial operation. The authorization establishes limits and conditions for operation and lists the programmes which should be kept active during operation, such as the radiological protection programme, the physical protection programme, the quality assurance programme for operation, the fire protection programme, the environmental monitoring programme, the qualification and training programme, the preventive maintenance programme, the retraining programme, etc. Reporting requirements are also established through regulation CNEN-NE-1.14[9]. These reports, together with a system of regulatory inspections performed by resident inspectors and headquarters personnel, are the basis for monitoring safety during plant operation.

Other governmental bodies are involved in the licensing process, through appropriate consultations. The most important ones are the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Institute for Environmental and Renewable Natural Resources - IBAMA), which is in charge of environmental licensing and the Coordination of Technical and Scientific Programmes of the Ministry for Science and Technology (MCT) with respect to emergency planning aspects.

3.1.2. Environmental licensing

IBAMA was created through Law n. 7.735 of 22 February 1989 under the Ministério do Meio Ambiente (Ministry for Environment - MMA) with the responsibility

to implement and enforce the National Environmental Policy (PNMA) established by Law N^o. 6938/81. The objective of the PNMA is to preserve, improve and recover the environmental quality, ensuring the conditions for social and economic development and for the protection of human dignity.

The PNMA established the National System for the Environment (SISNAMA), which is composed by the Conselho Nacional para o Meio Ambiente (National Council for the Environment - CONAMA) and executive organizations at the federal, state and municipal levels. The central executive body for SISNAMA is IBAMA, which is, therefore, responsible for the environmental licensing process of any installation with potentially significant environmental impact.

The environmental licensing process includes the following steps:

- Pre-installation Licence, given at the preliminary planning stage, approving the siting and general concept of the installation, evaluating its environmental feasibility and establishing the basic requirements and conditions for the next implementation phases.
- Installation Licence, authorizing the construction of the installation in accordance with the approved specifications, programmes and projects including measures which are considered essential to protect the environment.
- Operating Licence, authorizing the operation of the installation after the verification of the effective fulfillment of the previous licence conditions, and the effective implementation of measures to protect the environment during operation.

One of the requirements for the issuance of a Pre-installation Licence is the development of an Environmental Impact Study (EIA) and the preparation of an Environmental Impact Report (RIMA). The RIMA is prepared to explain the project and evaluate other alternative sites and technologies and to describe the proposed activities, in order to allow for public participation and discussion with the local community in an effective way.

Public participation in the environmental licensing process is ensured by legislation through the conduct of public hearings (CONAMA Resolution 09/87). One of the requirements is transparency in the process, through the publication in the official newspapers and local press of any licence application and the decision to grant it or not by the relevant environmental agencies.

3.1.2.1 Environmental Licensing of Angra 1, 2 and 3.

The construction of Angra 1 and Angra 2 took place before the creation of IBAMA. The operation of Angra 1 started in 1981, before the current environmental regulation was established.

At that time, the Fundação Estadual de Engenharia do Meio Ambiente (State Foundation for Environment Engineering - FEEMA), the Rio de Janeiro state agency in charge of environmental matters, issued an Installation License.

Since 1989, with the definition of the legal competence of IBAMA for environmental licensing of nuclear installations, with the participation of CNEN and state and local environmental agencies, IBAMA has been involved in the licensing process of Angra 1 and Angra 2.

The updating of environmental licence of Angra 1, in accordance with the current IBAMA requirements, is being done through an "adaptive licensing" to adjust the enterprise to the environmental regulations. This process defines the necessary environmental studies to be carried out and submitted to IBAMA in order to justify the issuance of an Operating Licence.

Although Angra 2 was already under construction, CONAMA determined that IBAMA should require from FURNAS, now ELETRONUCLEAR, the preparation of an Environmental Impact Study (EIA) and a Report on Environmental Impact (RIMA).

These documents were submitted to IBAMA and formed the basis for IBAMA evaluation of the environmental impact. They also served as a basis to define environmental plans and programmes detailed in a Basic Environmental Project (PBA), to be carried out by the licensee.

. The RIMA served also as a basis for the 2 public hearings about Angra 2 impact, which took place in the surroundings of the plant in the period of 1999-2000. Based on these evaluations and taken into consideration the discussion during the hearings, IBAMA has issued a special Licence for Initial Operation. Currently IBAMA is analysing the complementary documentation and evaluating the results of the environmental monitoring programmes to issue the Operating Licence for Angra 2.

With respect to Angra 3, IBAMA has proposed in 1999 the Terms of Reference for the preparation of the development of the EIA/RIMA which should be prepared under the responsibility of ELETRONUCLEAR.

Since CNEN has the technical competence for the evaluation of radiological impact in the environment, IBAMA and CNEN have established a formal agreement to specify the respective scope of action and to optimize both licensing processes (see also 5.1).

3.1.3. Emergency preparedness legislation

With respect to emergency preparedness, additional requirements have been established by the creation of the System for Protection of the Brazilian Nuclear Programme (SIPRON) through Law 1809 of 7 October 1980. The subsequent Decree 2210 of 22 April 1997 defined the Secretaria de Assuntos Estratégicos (Secretariat for Strategic Affairs - SAE), directly linked to the Presidency of the Republic, as the Central Organization of SIPRON responsible for the general supervision of the preparedness and response to nuclear emergencies in the Country.

More recently, a Governmental restructuring has designated the Ministry of Science and Technology (MCT) as the Central Organization for SIPRON, which now stays under the Special Advisor for the Coordination of Technical and Scientific

Programmes of MCT (see Figure 4).

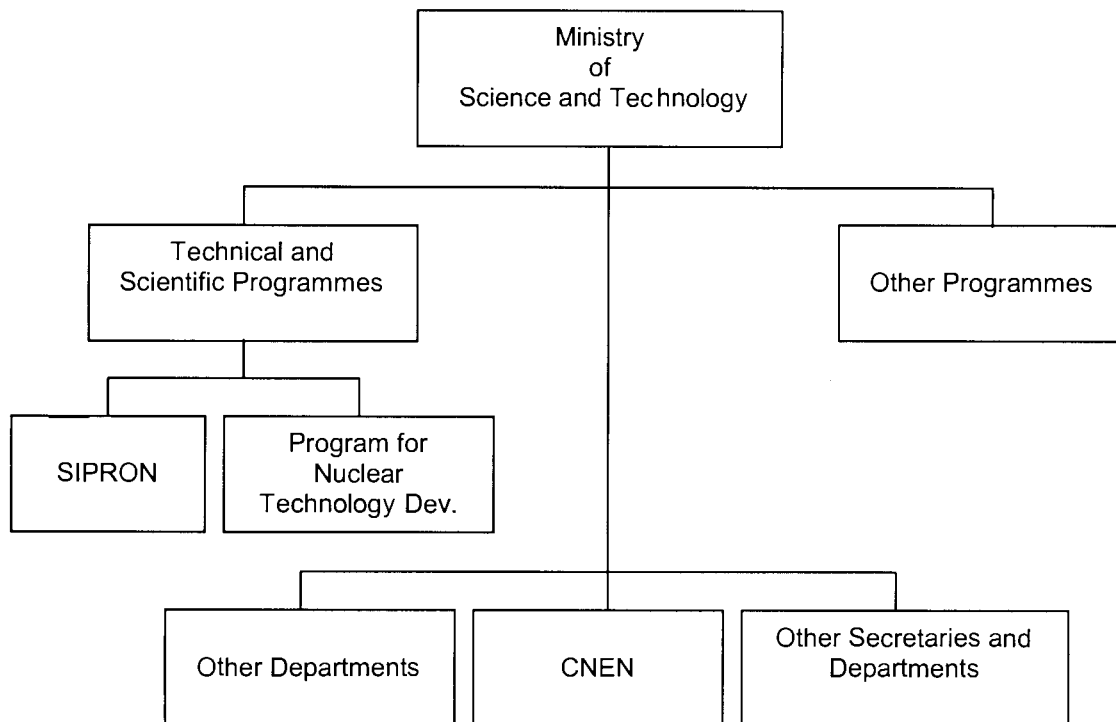


Figure 4 – SIPRON position within the MCT Structure

The Decree 2210 also establishes a system structure composed of the organization and agencies involved and the Commission for Protection of the Nuclear Programme (COPRON) as the coordination mechanism.

SIPRON guidelines, issued by COPRON (see Annex 2, item 2.5), require that ELETRONUCLEAR and the State Civil Defense prepare, keep up to date and exercise a plan for nuclear emergency situations. As a matter of fact, the guidelines require that CNEN and other organizations and agencies involved have their emergency plans, as well (see also item 4.7).

3.2. Article 8. Regulatory body

As mentioned in item 3.1, the Brazilian National Commission for Nuclear Energy (CNEN) has been designated as the regulatory body entrusted with the implementation of the legislative framework related to safety of nuclear installations. Other governmental bodies are also involved in the licensing process, such as the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA).

3.2.1. CNEN

CNEN authority is a direct consequence of Law 4118/62 and its alterations determined by Laws 6189/74 and 7781/89, which created CNEN. These laws established that CNEN has the authority “to issue regulations, licences and authorizations related to nuclear installations”, “to inspect licensed installations” and “to enforce the laws and its own regulations”.

Effective separation between the functions of the regulatory body (CNEN) and the organization concerned with the promotion and utilization of nuclear energy for electricity generation (ELETROBRAS) is provided by the structure of the Brazilian Government in this area. While CNEN is linked to the Ministry of Science and Technology (MCT), ELETROBRAS is fully owned by ELETROBRAS, a national holding company for the electric system, which is under the Ministry of Mines and Energy (MME) (see Figure 3).

The structure of CNEN is presented in Figure 5. The main organizational unit involved with the licensing of nuclear power plants is the Directorate for Radiation Protection and Nuclear Safety (DRS), although technical resources can be drawn from any other units in support of some licensing activities. Review and assessment is performed mainly by the Reactor Coordination (CODRE) of the General Coordination for Licensing and Control (GCLC). CODRE is also in charge of regulatory inspection of nuclear power plants, which includes a group of resident inspectors at the Angra site. In the areas of radiation protection and environmental monitoring, technical support is obtained from the Institute for Radiation Protection and Dosimetry (IRD). The necessary regulations and standards are developed by working groups under the coordination of the Norms Service (SENOR).

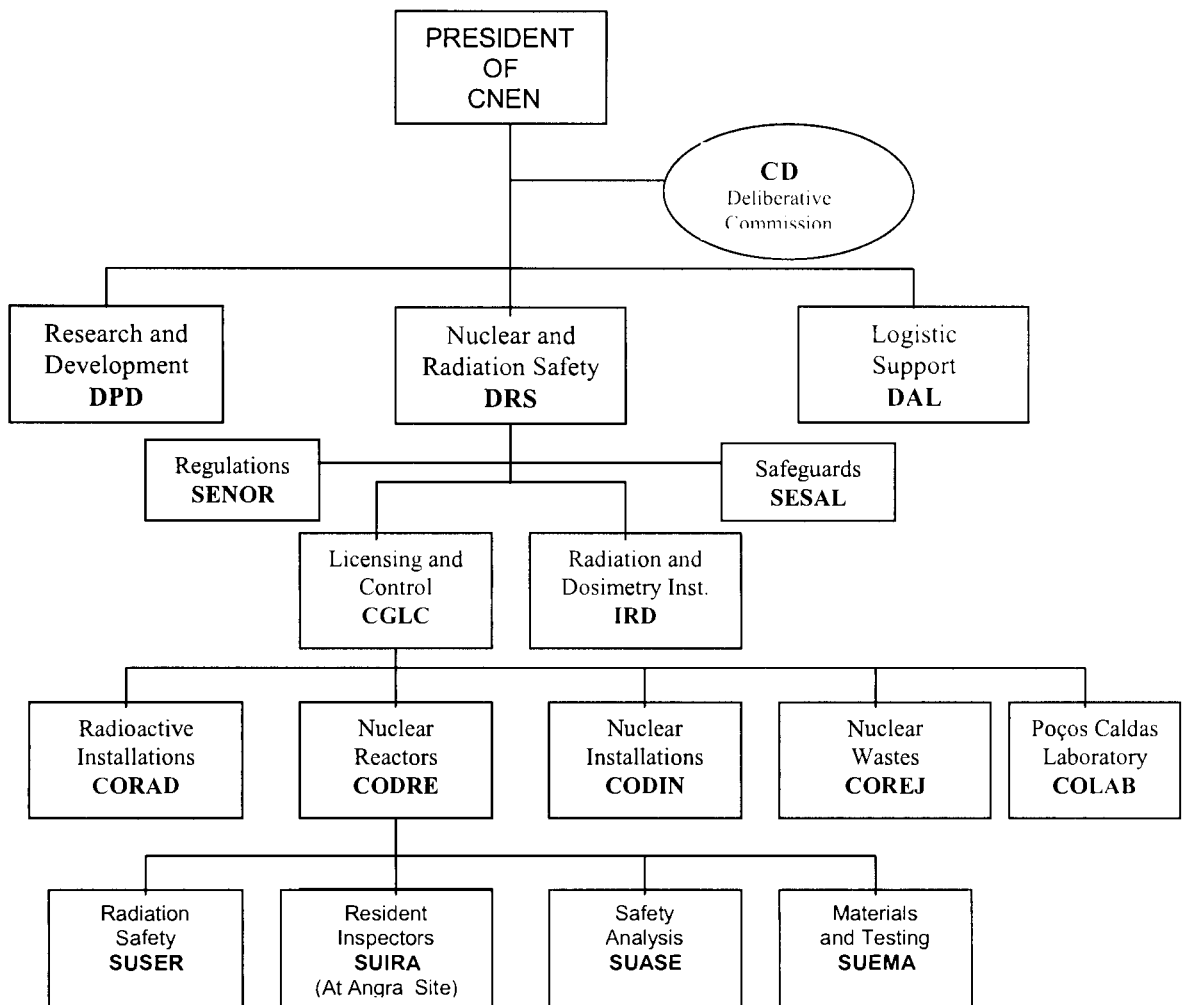


Fig. 5 – CNEN Structure

Adequate human resources are provided to CNEN. A total staff of 2756 people, of which 85% are technical staff, is available at CNEN and its research institutes. Forty eight percent (48%) of the staff are university graduates, 17% having a master degree and 7% having a doctoral degree. GCLC itself comprises 183 people, 149 of which are technical.

CODRE, the unit directly involved with nuclear power plants licensing and control, has a staff of 52, of which 47 are technical, with 9 possessing a doctoral and 24 a master degree in nuclear science or engineering. Presently, 7 persons are involved in a doctorate programme and 4 persons are involved in a master programme.

The main activities are review and assessment of the submitted documentation, and inspection of licensee's activities. Inspection activities are conducted on a permanent basis by a group of resident inspectors at the power plant site. For specific inspections and audit activities, support from specialists from headquarters is used. During 1998-2000, CNEN conducted 17 inspections in Angra 1 and 47 in Angra 2. Complementary to field activities, operation follow up is performed also based on licensee reports, as required by regulation CNEN-NE.1.14.

CODRE technical staff receives nuclear general training and specific training according to the field of work, including both academic training and courses attendance, technical visits, participation in congresses and national and international seminars.

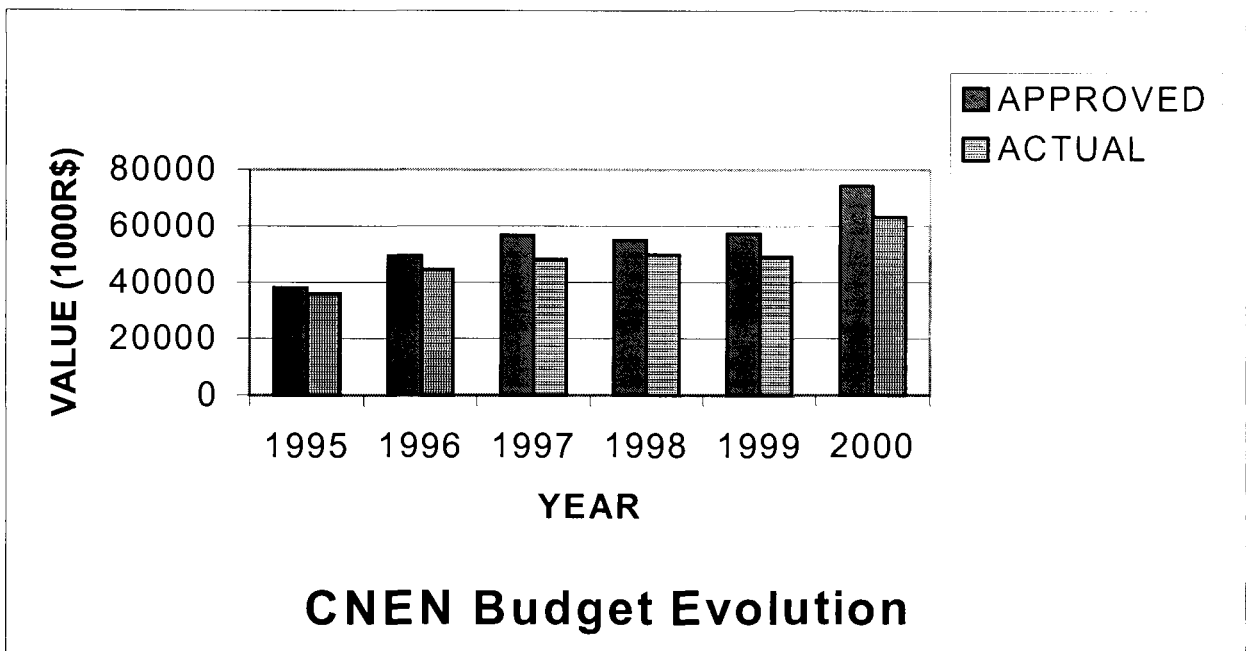
From the training courses conducted during the year 2000, the "Regional Basic Professional Course on Nuclear Safety", sponsored by IAEA and with participants from other Latin American countries, held on the Instituto Militar de Engenharia, in Rio de Janeiro, during the period of November 06 to December 15 must be highlighted.

CODRE personnel also attended, during the year of 2000, the following courses:

- Advances in Monitoring, Assessment and Enhancement of Operational Safety of Nuclear Power Plants
- High Studies on Politics and Strategy
- Evaluation of Environmental Radiological Impact
- Basic Radiation Protection
- Use of Computer Codes for Accident Analysis.

Also during the year of 2000, the following technical visits were conducted by CODRE personnel:

- National Oceanic Atmospheric Administration – NOAA (USA);
- Kernforschungszentrum Karlsruhe (Germany);
- HSK, Nagra and Zwiilag (Switzerland);
- Nuclear Regulatory Commission – NRC (USA);



- Gesellschaft für Reaktor Sicherheit – GRS (Germany);
- Pisa University (Italy).

In the period of 1999 - 2000, 13 technical assistance missions have been received from the IAEA and the Gesellschaft für Reaktor Sicherheit – GRS.

Financial resources for CNEN are provided directly from the Government budget. Since 1998, taxes and fees are being charged to the licensees, but this income is deducted from the Government funds allocated to CNEN.

Figure 6 shows the evolution of CNEN budget in recent years, demonstrating a slight increase. The distribution of this budget among the several areas of actuation is shown in Figure 7. However, one should notice that salaries expenses, one of the main components of the licensing activities, are not included, since they are paid directly by the central Government.

Fig. 6 - Evolution of CNEN budget in recent years (salaries not included).

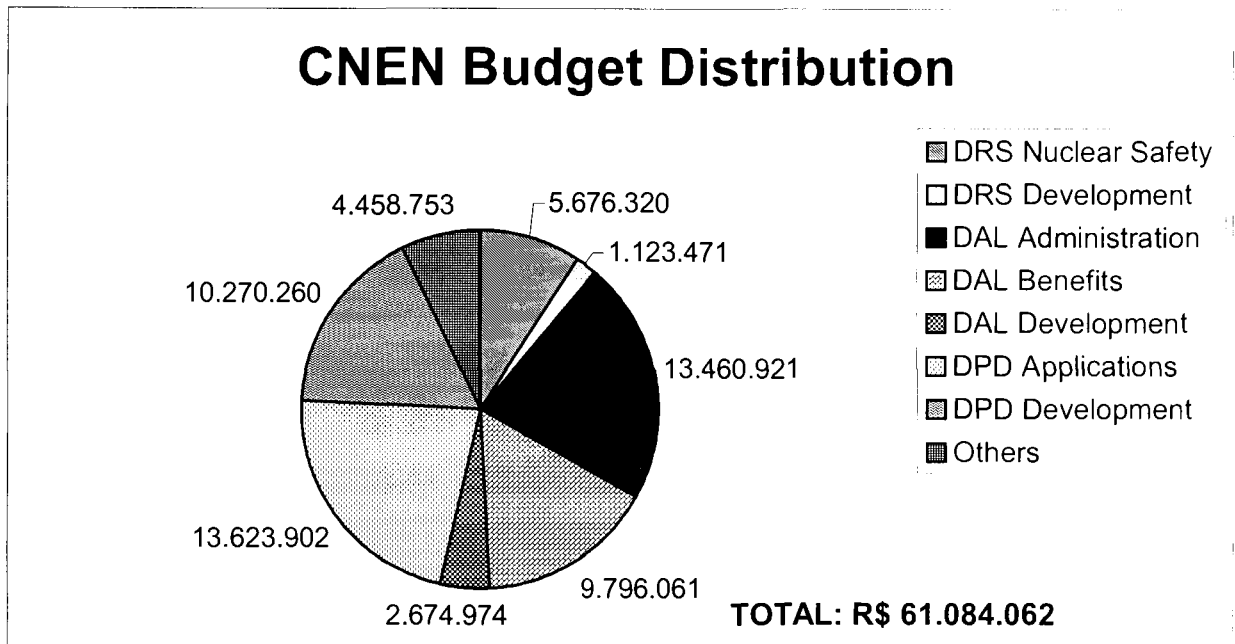


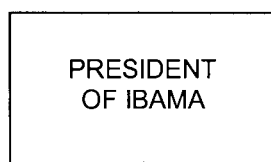
Fig.7 - CNEN Budget Distribution in 2001

Salaries of CNEN staff are subject to the Federal Government policies and administration. Presently there are two important concerns related to technical staff and salaries: i) most of the personnel is at the end of the scale; ii) the salaries are lower than those of equivalent utility personnel.

3.2.2 IBAMA

The licensing structure of IBAMA is presented in Figure 8. The environmental licencing for nuclear installations is conducted by the Directorate for Licensing and Environmental Quality, more specifically by its General Coordination for Environmental Licensing. This Coordination has a multidisciplinary technical staff of 35 professionals (3 PhD, 17 MSc and 15 Specialists), 11 of which are dedicated to the licensing of nuclear power plants (1 PhD, 5 MSc, 5 Specialists). There is an effort to adequate this human resources to an increased demand of evaluation in the nuclear area.

For the licensing process of Angra 2, IBAMA works in close cooperation with CNEN in relation with the radiological impact aspects. Both also cooperate with the Rio de Janeiro State Foundation for Environmental Engineering (FEEMA) and the Angra dos Reis Municipal Secretary for Environment.



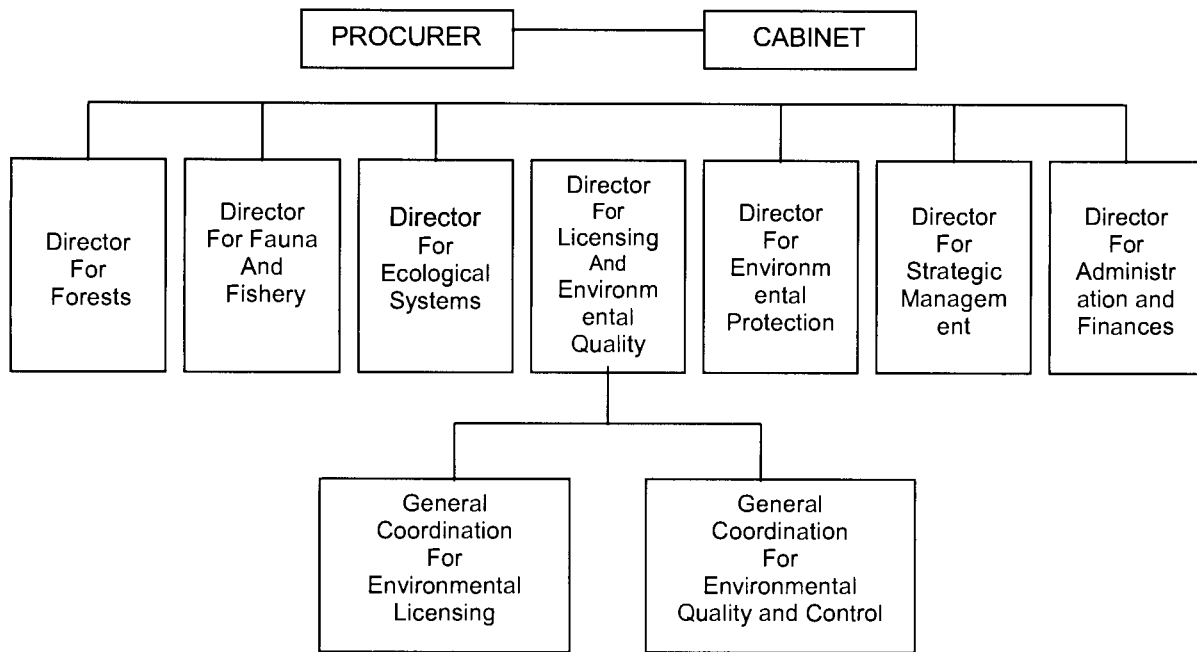


Fig. 8 – IBAMA Structure

3.3. Article 9. Responsibility of the licence holder

The Brazilian legislation defines the operating organization as the prime responsible for the safety of a nuclear installation.

Therefore, to obtain and maintain the corresponding licences, the operating organization, ELETRONUCLEAR, must fulfill all the prerequisites established in the legislation which are translated in regulations presented in Annex 2.

More specifically, the regulation CNEN-NE-1.26 [10] defines the operating organization as the prime responsible for the safety of a nuclear installation by stating: **“The operating organization is responsible for the implementation of this regulation.”**

ELETRONUCLEAR, as the owner and operator of the Angra 1 and Angra 2 plants, has issued a company policy stating its commitment to safe operation, which states:

“Safety is the priority and precedes production and economics. Safety shall never be jeopardized by any other reason.”

It states further that:

“Responsibility for safety is equally shared by all corporate structure – Directors, Advisors, Superintendents, Managers and Divisions Heads. Careless acts or actions by employees do not relieve the responsibilities of their supervisors”.

This company policy statement is fully based on the IAEA INSAG-4 publication on Safety Culture.

The implementation of this policy is based on a programme that adopts the concept of Safety Culture, defines safety objectives and establishes requirements, appropriate management structure, resources and self-assessment.

CNEN, through the licensing process, and especially through its regulatory inspection programme, ensures that the regulatory requirements for safe operation are being fulfilled by the licensee. The licensee reports periodically to CNEN in accordance with regulation CNEN-NE-1.14 [9]. In addition, CNEN maintains a group of resident inspectors on the site, who can monitor licensee performance on a daily basis. Finally, a number of regulatory inspections by headquarters staff take place every year, focusing on specific topics or operational events.