

Strengthening Radiological Safety at CNESTEN through Emergency Preparedness Exercises

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1. Background and Goal of the present work

Within CNESTEN, the Safety and Security Directorate conducts emergency exercises to enhance radiological safety and security at the Center.

This article provides an overview of the preparation of emergency exercises at CNESTEN aimed at testing the operational character of the Internal Emergency Plan (IEP), the arrangements made for the response, and the management of the crisis for an accident triggering the IEP.

2. The Internal Emergency Plan of the CNESTEN

2.1. Purpose

The Internal Emergency Plan (IEP) of the National Center for Nuclear Energy, Science and Technology (CNESTEN) represents the set of measures taken by the Center's management, in the event of a radiological, nuclear or toxic emergency to:

- Place the CNESTEN facilities in the least degraded state of safety possible and limit the consequences of accidents by implementing emergency procedures;
- Protect workers, neighboring populations, and the environment from ionizing radiation by limiting and controlling releases and implementing the necessary preventive and protective measures;
- Provide first aid to victims; Etc.

2.2. Description

At the operational level, the IEP describes:

- The CNESTEN and its facilities, including the Triga Mark II research reactor;
- The different accident situations envisaged to occur at the center and their classifications for triggering the IEP by level;
- The reference accidents (non-design basis accidents) that are considered for the CNESTEN facilities: the reactor facility, the radiopharmaceutical production facility, and the radioactive waste management infrastructure;
- The organization put in place if the IEP is triggered, in particular the activation of three command posts for crisis management operations: a management command post; a local safety and security management command post, and a field command post; Etc.



View of the CNESTEN's facilities*

(* From left to right: TRIGA Mark II Reactor; Radioisotope production facility; Waste management facility.

3. Management of a radiological or a nuclear emergency in CNESTEN

3.1. Technical Crisis Center (TCC)

For the management of a radiological or a nuclear emergency, CNESTEN has a technical crisis center (TCC), whose missions are:

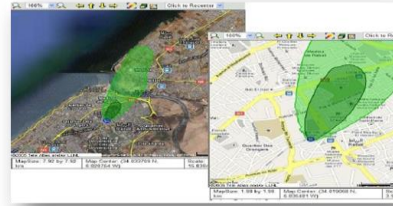
- To assess the radiological risks and consequences in case of an emergency;
- To recommend preventive and protective actions, in particular, based on CNESTEN's experience feedback, the IAEA (International Atomic Energy Agency) guidelines (Operational Intervention Levels), the analysis of the situation, etc.;
- To evaluate the dose rate and the shielding calculation.

For TCC to succeed in its mission, TCC uses human and material means, such as:

- A video conference communication system;
- Tools for calculating, modelling, and simulation (GIS, International Exchange Program, HotSpot, MicroShield, etc.);
- Radiological measurement equipment (two SPectral Advanced Radiological Computer Systems - SPARCS mobile and aerial); Etc.

4. Conclusions

- Emergency exercises carried out at the CNESTEN help to improve the measures implemented for emergency intervention to protect personnel, the public and the environment. These exercises have demonstrated their usefulness in training personnel and response teams to properly manage emergency situations that may occur within CNESTEN's facilities.



Simulation and map visualization with the IXP



SPectral Advanced Radiological Computer System

3.2. Emergency exercises

To improve radiological safety within the CNESTEN, the center carries out several emergency exercises, including a periodic global exercise to trigger the internal emergency plan, which involves all the CNESTEN's internal response teams.

The organization of such exercises allows the training of the emergency response team in crisis management and in achieving the objectives of the internal emergency plan.

The conduct of a periodic global emergency exercise at the CNESTEN requires following a set of preparation steps before the exercise to reach the global objective, which is good crisis management, as well as specific goals, such as:

- To increase the proper flow of information and to manage coordination between the different response teams;
- To promote the reactivity of the responders;
- To implement the necessary preventive and protective actions against ionizing radiation.



Conduct of a global emergency exercise at the CNESTEN

Among the steps for preparation of exercises adopted at the CNESTEN, we emphasize the choice of the scenario. In this sense, the exercise scenarios adopted are based, for example, on accidental situations described in the CNESTEN internal emergency plan. These accidental situations are exploited to develop exercise data, such as:

- The definition of the technical components of nuclear facilities and accidents likely to occur;
- The definition of events, critical moments and sequences of events of the accident concerning the scenario: these events trigger the actions of the response teams and lead to an increase in the radiation protection actions of the teams; Some examples of the trigger events adopted at the CNESTEN are:
 - o The failure of the ventilation system of a nuclear facility or the loss of containment of a facility;
 - o The malfunction of the fire detection system;
 - o The loss of control of radiological monitoring systems;
 - o The activation of a radiological environmental monitoring system alarm.
- The definition of the radiological data of the scenario: data on the facilities, meteorological data, etc.;
- The carrying out simulations using a calculation tool: to determine the extent of the actions of the responders and the means of intervention necessary to protect the response teams against radiation (Dosimeters; the type of respiratory protection devices to be used and other individual protection equipment; Radiometer; Contaminameter, etc.).