The regional Radiological Emergency Programs in Spain

The Valencian Community case

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A bit of history

The beginnings of the Nuclear Energy activities in Spain was in 1948.

A group of military and scientists created an organization that was focused on the training of qualified personnel and the study of the extraction, metallurgy and physics of uranium.

In 1951, a Nuclear Energy Board (JEN) was formed as a center for research and development of nuclear technology in Spain.

At that time, the first generation of nuclear power plants in Spain was launched (José Cabrera, Vandellós I and Santa María de Garoña).

NPP José Cabrera (**Madrid**)

NPP Vandellós I (**Tarragona**)

NPP Santa María de Garoña (**Burgos**)

After the political transition and the advent of democracy, the JEN was dissolved and replaced by two organizations:

1980 the Nuclear Safety Council (CSN).

- Responsible for the regulatory functions of nuclear and radiation safety.

1986 the Center for Energy, Environmental and Technological Research (CIEMAT).

- Responsible for research and development (among others) of nuclear and radiation matters.

CSN CONSEJO DE SEGURIDAD NUCLEAR

Ciemat

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

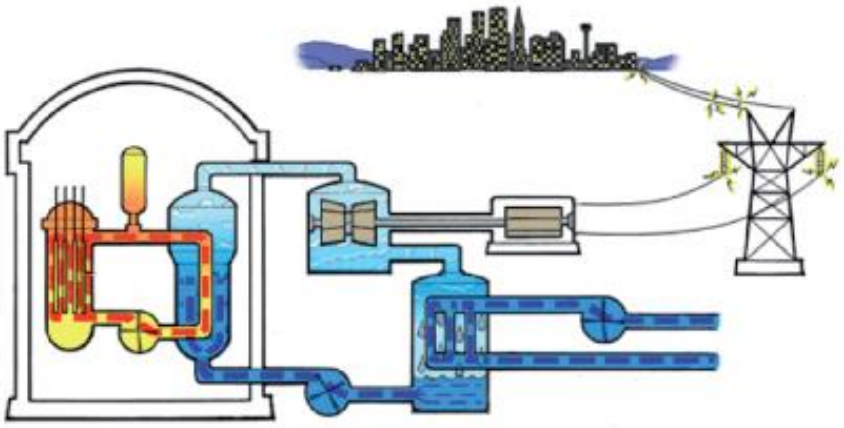
Spain Nuclear Power Plants

We had 3 generations of nuclear power plants, but all the plants of the first generation are now stopped and dismantled (or in process of decommissioning).

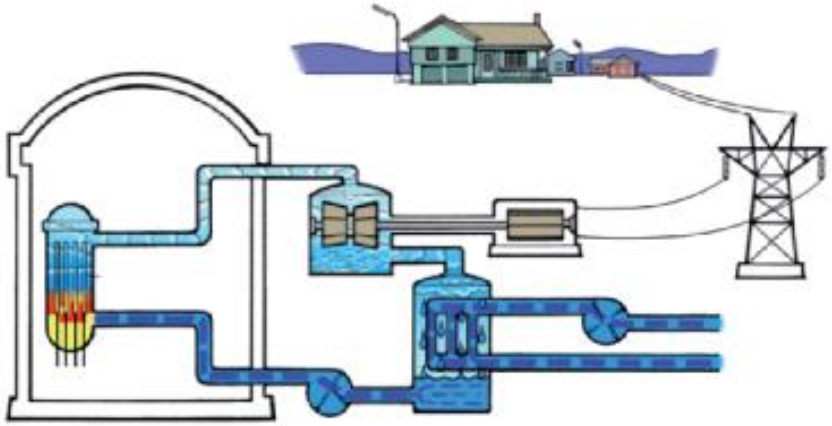
The closure of the entire nuclear park will take place between 2027 and 2035.

All the active reactors are water type reactors but there are differences between them.

Almaraz I and II, Ascó I and II, Vandellós II and Trillo I work with pressurized water but Cofrentes works with boiling water.



Pressurized water type



Boiling water type

Present legal situation

Spain is divided into regions (autonomies) with their own local government.

Although the Spanish Nuclear Security Council (CSN) is the national authority for nuclear and radiological matters, the regions can ask the transfer of the authority and related responsibilities, except those concerning to the working of NPP.

This is the case of Valencia region (Autonomous Community of Valencia), which holds the authority and responsibility of nuclear and radiological matters.

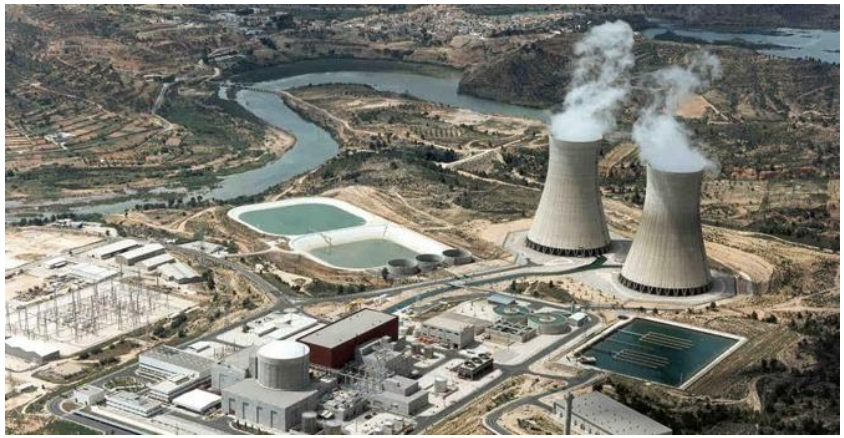
The Valencian Community situation and responsabilities

The Valencian Community is responsible for the environmental survey of Cofrentes NPP and the surveillance and security control of all the radiological and radioactive installations in its territory (as medical, industrial and research facilities).

Also the local government has recently approved a Radiological Emergency Program for the region (for radiological accidents not related to the Cofrentes NPP).

LARAM IFIC Laboratory:

The LARAM is counselor of Valencia local government in case of accident and is in charge of performing the measurement necessary for the authority decisions.



Cofrentes NPP

The Environmental Radiological Monitoring Program

The Valencia Universities (UV and UPV) collaborate with the Valencian government in the monitoring of lands and waters near Cofrentes NPP.

A number of periodical measurements of water, soil, vegetables, food and air filters are carried out and compared to similar measurements carried out by the Cofrentes NPP itself (PVRA program).

The measurements carried out are gamma, alphas and beta levels in environmental matrices as soil, water, food and air filters.

Measurements

Sample	Collection	Analysis
Raining water	continuous	gamma spectrometry and $^{89}Sr/^{90}Sr$
Drinking water	punctual	gamma spectrometry, beta total & beta rest, $^{89}Sr/^{90}Sr$ and ^{3}H
Superficial water	punctual	gamma spectrometry, beta total & beta rest, $^{89}Sr/^{90}Sr$ and ^{3}H
Underground water	punctual	gamma spectrometry, beta total & beta rest and ^{3}H
Crops	punctual	gamma spectrometry and $^{89}Sr/^{90}Sr$
Dust filters	continuous	gamma spectrometry, beta total and $^{89}Sr/^{90}Sr$
Goat's milk	punctual	gamma spectrometry, $^{89}Sr/^{90}Sr$ and ^{131}I
Cow milk	punctual	gamma spectrometry, $^{89}Sr/^{90}Sr$ and ^{131}I
Foods	punctual	gamma spectrometry
Indicator organisms	punctual	gamma spectrometry and $^{89}Sr/^{90}Sr$
Sediments	punctual	gamma spectrometry and $^{89}Sr/^{90}Sr$
Floors	punctual	gamma spectrometry and $^{89}Sr/^{90}Sr$

Additionally, we take part of intercomparisons that measure the skills of the personnel and of the lab equipment in different types of measurements.

The Radiological Emergency Program

This program has the purpose of planning actions to be taken by the local authority in cases of radioactive accidents that are not included in the emergency plan for NPP or in the emergency plan for transport accidents of radioactive items on the road.

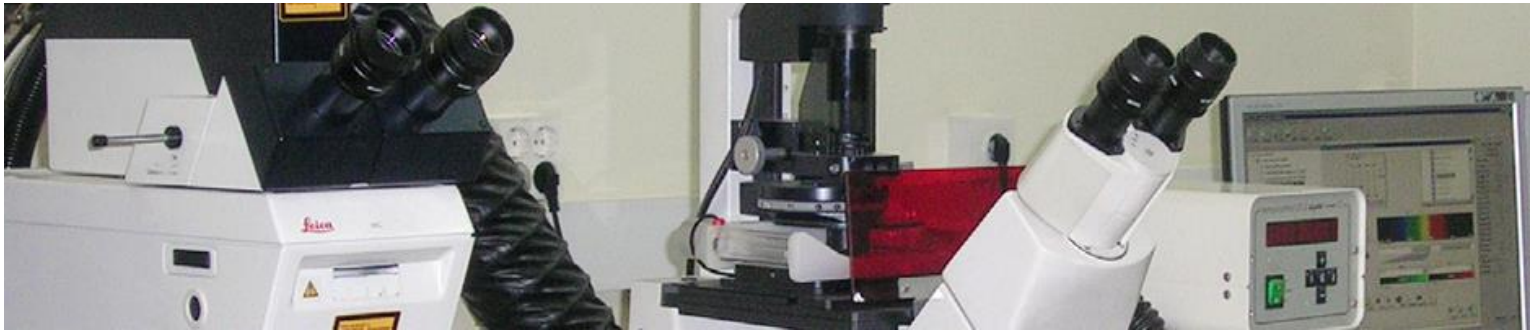
This program includes:

- Fires and other kinds of accidents in radiopharmaceutical industries, research centers and other sites holding radioactive sources.
- Orphan sources left as a result of illicit traffic of radioactive material.
- Falling of a satellite.
- A dirty bomb.

Role of University Laboratories

The Valencia Universities (UV and UPV) are the counselors of the government in radiological emergency matters.

We must be able to analyze contaminated samples from the accident site, providing isotopic composition and activity of the contaminant, to help the authorities in order to take the corresponding actions.



Actions to be taken for measurements

1. **Sampling:** Samples of the affected land should be taken by trained personnel, such as firefighters, following the indications of scientist to avoid exposure and to take the necessary amount of samples. Affected land has a high probability of being in zones of difficult access.
2. **Initial evaluation of sample activity:** Samples have to be measured in a hot laboratory to evaluate total activity.
3. **Avoid contamination of the clean laboratory** (environmental radioactivity).
4. **Avoid dead time:** Subsamples of sufficiently low activity to avoid dead time in a germanium detector have to be prepared and labelled. Wrong preparation of samples producing a high dead time would entail lost of time.

Accident drills carried out

Two accident drills have been carried out by the regional government up to now:

1. **Failure of closure of an industrial source of high activity near an injured worker (lacking of mobility).**

   Firefighters approached the source, and remained near it in a way that would have produced high exposure to them in the case of a real source.

2. **A source of high activity found in a container in the Valencia harbour.**

   There were communication difficulties between police officer, firefighters and border police. The radios were not tuned in the same frequency and finally they talked in a way in which mutual understanding was difficult.

Analysis of the drills

- **Lack of knowledge:** Firefighters did not seem to have understood the way to tackle situations involving radioactive sources.
- **Communication issues** between the different bodies of officials involved in the drill are due to two facts:
  1. The involvement of more bodies of officials than in usual accidents (that are tackled essentially by firefighters and people used to work with them).
  2. The lack of understanding the peculiarities of a radiological accident and the importance of radiological dose, by people used to work in usual catastrophic events (fires, floodings,…).

Drill for a dirty bomb

The consequences of a dirty bomb are not known in the real situation:

- range
- distribution of radioactive material
- efficiency of cleaning procedures

A real drill would be to prepare a dirty bomb with a short life time isotope such as ^{99m}Tc, widely available for hospitals.

This has been suggested in collaboration with the Military Unity of Emergences (UME) in their shooting range.

But, the Spanish authority (CSN) would not allow such a test.

Skills to be developed in university laboratories

In the cases of soil sampling, large inhomogeneities are expected.

The reduction of soil to a liquid sample would reduce greatly the inhomogeneity and would facilitate the preparation of a subsample of low activity.

The procedures that would allow this, are:

- Lixiviation of initial samples by acids.
- Dissolution of samples in hydrofluoric acid.

This will be studied in the near future in the framework of a project devoted to the study of contaminated lands in Spain.

Discussion

There are **many unknowns** due to the (fortunately) lack of experience in radiological accidents.

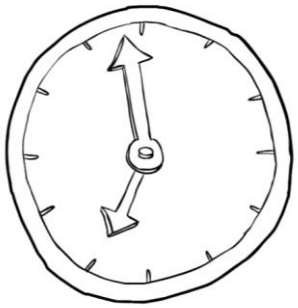
Although there is universal knowledge gained in accidents around the world, this **knowledge is not easily transferred to non experienced people**.

In the particular case of Spain, local governments are publishing regulations to handle (from scratch) the new radiological risks produced by technological advance, international trade and international terrorism.

A **general protocol** to stablish and give procedures to tackle these new risks at, maybe, the European level, addressed to all the concerned organizations, would be highly appreciated.

Conclusions 1

- It is necessary to **adapt the protocols** of the regional environmental radioactivity monitoring program to the radiological emergency issues.
- For emergency situations **measurements have to be carried out quickly**.
- Samples of high activities have to be reduced to measurable activities, **avoiding high dead-time** in a short time.



Conclusions 2

- In radiological emergency situations **problems of communication** between different emergency services involved could appear. **Important issue to be solved**.
- **Periodical training of professionals involved** is a must.
- **Drills to deal with radiological emergencies** are necessary. There exist no official protocol, therefore our task is to develop one.