SOCIAL, ECONOMIC, INSTITUTIONAL AND POLITICAL IMPACT IN ROMANIA OF THE CHERNOBYL ACCIDENT

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1. BEFORE CHERNOBYL

The Chernobyl accident has found Romania with a good tradition in the nuclear field that had been founded on a renowned school of nuclear physics and the existence of nuclear centers for research endowed with nuclear reactors and other relevant nuclear installations. Furthermore, the operation of hundreds of nuclear facilities licensed by the Regulatory Authority up to 1961 and the national nuclear power program, this aimed to the commission of five PHWR-CANDU in the eastern part of Romania, on the Danube bank at Cernavoda, provided sufficient conditions for a general comprehension of the nuclear domain problems.

At that time in Romania had been working an inter-ministerial General Head Quarters for intervention in case of nuclear accident and two national surveillance networks, [1], see appendix 1, with 30 years of experience in the monitoring of the environment factors, e.g. air, potable and non-potable water, soil, vegetation, foodstuff as well as the individuals from public. These networks had been promoted, endowed and trained in a preliminary phase by the Institute of Atomic Physics, IAP, that had among its responsibilities that of the promotion of the atomic energy at a national scale. Consequently, on the landscape of Romania there had been known the values of the radioactive content of air, water, soil, vegetation and human body including the influence of Romania’s own nuclear facilities to the enhancement of the local radioactive background, [2]. Moreover it had been established a system of procedures for notification that stipulated among the measures taken that of the intensification of the monitoring in case of nuclear emergencies.

As concerns the organizational framework, it is worth to say that at a ministry level had functioned the State Committee for Nuclear Energy which embraces together the coordination and promotion of nuclear energy as well as the regulatory control for the nuclear practices.

2. DURING THE CHERNOBYL ACCIDENT

Because of the data received from the national networks for monitoring of environmental factors, Romanian’s authorities started alerting and alarming actions on the 29th of April 1986 when the radioactive cloud reached the Romanian territory from east and north. The General Head Quarters for interventions and an ad-hoc commission analyzed the values and decided to take protective measures. However, the Central State Government adopted the undesirable choice of giving official statements with rather scarce information although it had as available pertinent estimations and sufficient data. For this we have as a witness a synthesis of the radiometric measurements, [3], appendix 2, together with associated estimated consequences that had been submitted to United Nations Scientific Committee on the Effects of Atomic Energy, UNSCEAR, and embodied in its annual reports. The results had been coherent to those reported by the neighbouring countries as well as to the estimations made by other experts.

3. SOCIAL, ECONOMICAL, INSTITUTIONAL AND POLITICAL CONSEQUENCES

The Romanian society, on a whole, had been profoundly impressed by the Chernobyl accident, this fact has been mainly owed to:
- the values of radioactive contamination on the territory of Romania, these exceeded the local radioactive background considerably;
- the inherent proximity to the place of accident;
- some elliptical and over-estimated official statements spread about through radioactive background.

There have been strong and various pressures, from the highest state dignitaries to profiteers of the new raised emergency. They claimed for preferential actions concerning protective measures at theirs particular residences or demanding prophylactic substances in unjustified quantities or imperiously asked for being internally monitored at the whole-body counter facilities.

524
In the last years, grounded on an general democratic surge that embraces all the society, have been established non-governmental organizations with preoccupation aimed to the protection of the environment that promote at the same time impartial as well as constructive opinions on nuclear field impact; among them we mention the Romanian Society for Radiological Protection, [4], that is wholly accepted as having positive impact in our society.

Consequently, in spite of information concerning Chernobyl and Koslodui- Bulgaria, as well as opposition of some foreign factors for the future development of nuclear choice, the Romanian society has been keeping an attitude of acceptance of nuclear power. This position is based on a correct decision of the Romanian officials, focused on the most safety reactor and in any case one with containment. The opinion have been sustained by a wide-spreadening reports on the technical and management international visits performed at the site of Cernavoda NPP, among them those of WAMAP, RAPAT and OSART missions as well as some leaders of the most relevant international bodies: the General Manager of the Intentional Agency for Atomic Energy, dr. H. Blix, the General Manger of the Nuclear Energy Agency of the Organization for Economic Co-operation and Development, dr. K. Uematsu. All these have been leading to sentiments of a general confidence in nuclear power as well as to the acceptance of the international interest for it due to its possible transboundary social, economic, institutional and political effects.

The first power reactor will be commissioned in Romania in 1996, ten years after the Chernobyl accident, with positive social and economic consequences. Our hopes in the domain of nuclear power production are tightly connected with the carrying on work at the second unit at Cernavoda, this is in an advanced level of mounting of the main equipment, and after that the running on the efforts for the 3rd, 4th and 5th units. The existence of an appropriate site accepted by national and international authorities and the presence nearby of a population attached spiritually and economically by this plant, as well as the scarce of power in the neighbouring area, that includes not only Romania, are strong arguments which states pro the future development of Cernavoda NPP.

The main consequences of the Chernobyl accident have been complex:

• there have been important perturbations in the national trade and transport, some countries rejected commodities or turned down perishable goods or delayed transports due to the lacking or even ignoring the international agreements, [5]; it is worth to be noted that the country’s reactions were widely different, from some which were fully aware in accepting the goods on the evidence of measurements to some inflexible that rejected transports only because these came somewhere from the direction of Chernobyl;

• there were cases of impossibility of carrying out current operations of importance for national economy, such as the usage of tracers in the petroleum industry.

• there could not be carried out endocrinology analyses because of radioactive compounds of iodine in atmosphere;

• there were compromised some researches that relied on a low background for the environment;

• there were disturbances in some social and economic activities as well as in education and tourism;

• there were significantly losses of foodstuff, especially milk and dairy products;

• it was perturbation in supplying with water.

The Chernobyl lesson emphasized the necessity of reorganizing of the national monitoring network’s structure and operation as well as the importance of having specialized organisms for intervention, these must to be involved in-field exercises together with the mobilization of large groups of population in the proximity of Kozlodui NPP, placed at the border between Romania and Bulgaria.

It is important to mention that during the cloud’s passage of the national territory and shortly after that, from thousands of amateur photographers nobody reported the degradation, veilance, of the films, so it can be inferred that the external gamma dose did not exceed 0.4 mSv.

However, the expenses for decontamination and the medical attendance, the perturbation of others economic activities will remain still without answer.

An interesting point, in the discussions carried out between the political decedent factors and the technicians, was the cause of the Chernobyl accident in the strange context of an experiment thought to enhance the safety systems in a reactor initially stopped. This exceptional situation, not comprehended then, was generated both by failure of technical systems and, mainly, by unexpected human errors. It must be recognized that from this regretful event each designer, constructor, mounter, operator has reconsidered his conceptions and after that provided additional funds and training for safety purposes. Thus, nuclear safety, or more generally radiation safety, became a priority domain in our nuclear world.
At the institutional level changes have been occurring constantly after 1989 toward legislative and administrative aspects.

The adoption of the new Constitution and its provision that stress out the priority of the international legislation, have created opportunities for the endorsement by the Parliament of nuclear regulations. Thus, on its agenda are under discussions new nuclear laws on the organizational aspects and the promotion of the nuclear field, as well as on the authorities for regulatory and interventions.

On the other hand, as concerns administrative aspects, after the dissolution of the State Committee for Atomic Energy three institutes have been laid down:

- the National Agency for Atomic Energy, NAAE, depending by the Ministry of Research and Technology, that promotes nuclear domain at the national level, [6]; particularly it coordinate researches related to the Chernobyl effects as well as international projects with IAEA, OECD/NEA on the some subject;
- the National Commission for the Control of Nuclear Activities, NCCNA, depending by the Ministry of Waters, Forests and the Environment Protection, connected with the regulations and the control of the nuclear practices;
- the Central commission for the intervention at Nuclear Accident and at the Falling of the Cosmic Objects, CNAFCO, with responsibilities related to intervention at nuclear accidents and at radiological emergencies; this embraces officials from ministries and from NAAE, NCCNA and IAP.

Besides, much more attention is dedicated to local institutes: the sanitary police, for problems concerning radiation, and the police for fighting against illicitly traffic with radioactive substance.

Political leading parties have been sustaining the commissioning of the Cernavoda NPP and the development of the associated activities but all these within the limits of the annually budget. All the platforms of the relevant political parties have provisions that are favorable to nuclear field, however there are stated diverse preoccupation and objectives for the protection and the safety of the industrial installations that have associated risk of accidents.

4. CONCLUSION

1. Romania is among the countries in which took place social, economic, institutional and political effects of the Chernobyl accident;

2. The Romanian society, on a whole, had been profoundly impressed by the Chernobyl accident because of: the values of radioactive contamination on the territory of Romania, the inherent proximity of accident place, some elliptical and over-estimated official statements spread about trough mass-media;

3. There took place perturbations of the economic life, among them: rejection of some commodities and perishable goods, impossibility of carrying out current operations of importance for national economy, compromising of some researches that relied on a low background for the environment, losses of foodstuff, especially milk and dairy products, perturbation in supplying with water.

4. At the institutional level changes have been occurring constantly after 1989 toward both legislative, new nuclear laws are under debates in Parliament, and administrative, separately competent authorities for nuclear energy promotion and regulatory control were laid down, aspects.

5. Radiation protection and nuclear safety culture have reached a satisfactory level for the society and political speeches do not annoy anyone when there are proposing poll taxes for insurance of decommissioning of Cernavoda NPP and transport of radioactive waste activities.

REFERENCES
MINISTRY OF ENVIRONMENT - Environmental Radioactivity Laboratory
Institute of Environmental Research and Engineering

National Environmental Radioactivity Surveillance Network Stations

1 - Satu-Mare
2 - Oradea
3 - Tg.Mures
4 - Cluj-Napoca
5 - Deva
6 - Timisoara
7 - Babele
8 - Brasov
9 - Drobeta Tr.Severin
10 - Craiova
11 - Pitesti
12 - Constanta
13 - Tulcea
14 - Galati
15 - Buzau
16 - Suceava
17 - Toaca
18 - Iasi
19 - Bacau
20 - Bucuresti
21 - Bechet
22 - Sf.Gheorghe
23 - Cernavoda
24 - Baia-Mare
25 - Zimnicea
26 - Rm.Vilcea
27 - Piatra-Neamt
28 - Arad
29 - Ploiesti
30 - Slatina
31 - Focsani
32 - Alba-Iulia
33 - Calarasi
34 - Resita
35 - Botosani
36 - Tr.Magurele
37 - Giurgiu
38 - Bistrita
39 - Sf.Gheorghe
40 - Vaslui
41 - Tg.Jiu
42 - Zalau
Table I: Radioactive concentrations for the relevant radionuclides in Romania in 1986 after the Chernobyl accident, values are given in Bq/l or Bq/Kg

<table>
<thead>
<tr>
<th>Radionuclide in the specific product</th>
<th>may</th>
<th>june</th>
<th>july</th>
<th>august</th>
<th>september</th>
<th>october</th>
<th>november</th>
<th>december</th>
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<td><strong>I-131</strong></td>
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<td>-milk</td>
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<td>5</td>
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<tr>
<td>-dairy products</td>
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<td>50</td>
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<td>-vegetables and fresh fruits</td>
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<td>50</td>
<td>10</td>
<td>-</td>
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<tr>
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<tr>
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<td>40</td>
<td>20</td>
<td>18</td>
<td>15</td>
<td>10</td>
<td>5</td>
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<tr>
<td>-dairy products</td>
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<td>60</td>
<td>50</td>
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Table II: Intake of radionuclides through ingestion after the Chernobyl accident, 1986, [Bq]

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>may</th>
<th>june</th>
<th>july</th>
<th>august</th>
<th>september</th>
<th>october</th>
<th>november</th>
<th>december</th>
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</thead>
<tbody>
<tr>
<td><strong>I-131</strong></td>
<td>25,000</td>
<td>3,000</td>
<td>500</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Cs-137</strong></td>
<td>7,700</td>
<td>4,000</td>
<td>2,800</td>
<td>2,300</td>
<td>2,000</td>
<td>1,800</td>
<td>1,300</td>
<td>600</td>
</tr>
<tr>
<td><strong>Cs-134</strong></td>
<td>3,850</td>
<td>2,000</td>
<td>1,400</td>
<td>1,150</td>
<td>1,000</td>
<td>900</td>
<td>600</td>
<td>300</td>
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<tr>
<td><strong>Te-132</strong></td>
<td>800</td>
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<tr>
<td><strong>Sr-90</strong></td>
<td>400</td>
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Table III: Committed Effective Dose corresponding to the above values, [mSv]

<table>
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<tr>
<th>Radionuclide</th>
<th>may</th>
<th>june</th>
<th>july</th>
<th>august</th>
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<td><strong>I-131</strong></td>
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<td><strong>Cs-137</strong></td>
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<td><strong>Cs-134</strong></td>
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<td>5</td>
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<td><strong>Sr-90</strong></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>1,450</td>
<td>240</td>
<td>90</td>
<td>50</td>
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<td>30</td>
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Figure 1  Equivalent dose in thyroid, adult, via inhalation, mSv.

![Graph showing equivalent dose in thyroid, adult, via inhalation in May.]

Figure 2  Equivalent dose in thyroid, adult, due to ingestion of dairy products, mSv.

![Graph showing equivalent dose in thyroid, adult, due to ingestion of dairy products in June and May.]

Figure 3  Equivalent dose in thyroid, adult, due to ingestion of milk, mSv.

![Graph showing equivalent dose in thyroid, adult, due to ingestion of milk in June and May.]

529
Figure 4  Equivalent dose in thyroid, adult, due to ingestion of vegetables and fresh fruits, mSv.

**Vegetables**

- 1-10 June
- 21-31 May
- 11-20 May
- 1-10 May

**Fresh fruits**

- 21-31 May
- 11-20 May
- 1-10 May