

## **RADIOACTIVE GARBAGE AND THE ENVIRONMENT**

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### **ABSTRACT**

The radioactive garbage lead about 1.000 the 10.000 years being considered inactive, their treatment and disposal have to obey some rigid criteria of legislation and security, with an appropriate and safe place, preserving the environment and the population of the planet. The problem is to reach an agreement on the place and to have financial policy disposal for its construction.

### **1. INTRODUCTION**

In a world that has faced of form continues the population increase, the growth of the industrial production, economic expansion e, as consequence, the increase in the energy consumption, is a primary concern to be able to guarantee the supply of trustworthy form, of energy production.

This quarrel is particularly excellent when we take in consideration the great occurred changes in the world in these last 10 years, as for example, the international increase in the price of the oil, conflicts and the concerns with the half-environment. To explore the future contribution of the nuclear technology and possibilities of all the power plants currently developed, encouraging the use of viable power plants that gradually can complement and later to substitute the oil and the coal for less aggressive power plants for the half-environment.

The International Agency of Energy (AIE) comes insisting, with the whole world governments so that they invest in nuclear energy. For the first time in its 32 years of existence, the AIE if locates strong in favor of the nuclear energy. The agency says that this is essential in such a way to fight the global heating how much of the point of view of guarantee of the electricity suppliment, diminishing the dependence of the oil of the Middle East.

Some countries, including U.S.A., India, China and France, already are planning new plants. Already Germany and Spain are against. In Brazil the government seems to have changed its position, with the conversion of the minister Dilma Rousseff, e already speaks not only in concluding Angra 3, but in new plants.

In this context, he is that we start to argue and to analyze the following questions, considering the world of general form and Brazil, in a particular context: The treatment and dismissal of radioactive garbage, as well as security aspects nuclear.

### **2. THE ENVIRONMENTALIST POSITION**

The questions the solutions proposals for the nuclear central offices for the destination of the radioactive garbage. According to them, it will be able to have contaminations of air caused by explosions or continuous emptying of gases of a small farm (possible theoretically), or

contaminations of the water, caused for emptying of the packs that the garbage store and that they could reach a water sheet. The fact is that, mainly with regard to the garbage of high radioactivity, to be found solution must take in account the long stocking-life of the radioactive garbage, that arrives the thousand of years.

The adjusted solution more, today, for the radioactive garbage of long life it would be to cool them in the surface during 10 years and to embed them it great depth in layers geologic adjusted(salt, clay, granite, shale), without underground water circulation and risks of earthquakes. This solution, however, impracticable must to the high cost and lack of places adjusted for the construction of the deposits.

### **3. CURRENT DESTINATION OF RADIOACTIVE GARBAGE**

The removed of the reactor and, in general, it goes being stored temporarily in swimming pools of cooling in the inside of the proper plant. At the measure that these swimming pools go being full, many reactors arrive to have of being off due to lack of space for storage of this mortal residue. In accordance with estimates of the International Agency of Atomic Energy(AIEA), the total amount of combustible expense was of 125 a thousand tons in 1992 and goes to go up for 200 a thousand tons in year 2000 and for 450 a thousand tons in middle of the next century. However, even so diverse methods of destination have been argued during decades - including the sending for the space - not yet have solution for the nuclear garbage.

The majority of the currently solutions proposals for the final disposal of the nuclear garbage involves its burial in the subsoil in a special packing with strong protection the sufficient one to hinder that its radioactivity has escaped. The nuclear industry of understanding that, after any form of processing, the disposal in the subsoil or the deep one of the sea will be insurance enough. This philosophy was generated mainly had to the pressures to have to convince a public worried in knowing if the nuclear industry knows as to give final destination to these residues. However, this affirmation is to false.

Pretender, as the nuclear industry frequently makes it, that some experiences, geologic perforations of test or surveys is everything what is necessary for the handling of the nuclear garbage simply is dissimulation or scientific ignorance - or, possibly, both the things. The adequate tests would demand sets of ten of thousand of years.

#### **3. 1 Main risks in the burial of the nuclear garbage: the contamination of the air and the water**

- Contamination of the air

The explosive or slow releases of gases of an place of final destination are possible theoretically. Unfortunately, it does not have trustworthy form esteem this risk - it has excessively relative incognito to the current methods of deposition and to the possible chemical interactions in an real environment.

- Contamination of the water

General this is considered on mechanism of most likely pollution to the final disposal of residues in rocks. Radioactive elements can leak of the pack and to enter in contact with the water sheet, contaminating drinking waters of local communities and distance.

Beyond the burial of the residues, some projects of storage in the use place are being investigated. In this, the used fuel storage in great steel containers or concrete is of interest

original. Despite this type of storage conserves the material in the point where it was created and it reduces the transport costs, hundreds of the whole world communities are threatened in fact by deposits of high level to its doors. Also it has plans to consolidate the used fuel and to place it in drum in some few regional installations of surfaces, what it results in an immense number of trips in possible destined containers not to resist accidents.

The more good solution for the future will be the discovery of a method to use to advantage in 100 % the produced nuclear garbage in any part of planet.

#### **4. THE DISACTIVATED OF NUCLEAR PLANTS**

The big plant amount of the nuclear garbage also is produced when a nuclear reactor is disactivated. This because many of the parts that compose it, including the fuel, become radioactive. They cannot simply be plays it are. The process of treatment of a plant of energy in this point is called disactivated. However, beyond the removal of the used fuel, it does not have consensus on what it must happen to follow. The reactor of normal dimensions was disassembled in place some of the world. Despite some countries plan to remove all the structure, even though the radioactive parts, remaining a vacated plain space; others suggest to leave the construction where it is, covering it with concrete or, possibly, embedding it under a mount of ground.

The cost of the disactivated of the nuclear reactors it is object of much speculation. The estimates of cost originate from generic studies, from the projection of the costs of disactivated of small installations of research. The used detailing and sophistication in the development of these estimates vary excessively; the standardization lack becomes difficult the comparisons. Moreover, the limited experience of disactivated - none, if considered reactors of great transport - becomes impossible to know if the estimates are reasonable, but already one suggested that the disactivated costs could be of up to 100% the construction cost initial.

The next the three decades, more than 350 nuclear reactors will be disactivated. Since that the first nuclear plant started to produce electricity, the nuclear industry still today does not have answers on as to dismantle, of safe and economically efficient form, a reactor.

#### **5. CURRENT ASPECTS OF THE NUCLEAR SAFETY**

The security storage of the nuclear garbage in the plants still are provisory because it does not have one national politics on the final destination of this material. Not even Germany and the United States, countries of which Brazil acquired the nuclear technology, have definitive solutions for the nuclear garbage. Since 1988, the Legislative argues the destination of the nuclear garbage without arriving at a consensus. After to pass for the Senate, the project was up to 1999 motionless one in the Commission of Mines and Energy of the Chamber. Its reporter, the representative Antônio Feijão (PST-AP), arrived to visit nuclear plants for the world, but never concluded the work. Ahead of the morosidade in the transaction of the project, the member of the house of representatives Luiz Sérgio Nóbrega (PT-RJ), obtained to convince the speaker of the house to transfer the project to the Commission of Environment. Before arriving at the plenary assembly, the project still passed for the Commission of Constitution and Justice. The representative Fernando Gabeira (PV-RJ) announced that he would go to ask for to the speaker of the house, Michel Temer (PMDB-SP), to place in regimen of urgency the voting of the project of law 189/91, of authorship of then the senator Itamar Franco, who regulates the destination of the nuclear garbage in Brazil. The project was not voted in April of 2000, but in the end of May. The Armed Forces had obstructed regulating course of the project, because they do not want its sheds being inspected by the

society civil. Beyond establishing the process of election of the places, determine some type of incentive to the city that if to make use to shelter the definitive deposits. In the project that now this in the Senate, the military installations are exempt of payment of tax to the cities where they develop on nuclear activities to the national. The security states that produce greater amount of nuclear garbage are Rio de Janeiro, São Paulo and Minas Gerais. In the State of Rio de Janeiro it not only has garbage of the two cove plants, but also of the fuel plant of Resende, of the Institute of Nuclear Engineering of the Island of the Fundão and the Institute of Radioprotection and Levels, beyond the produced ones in clinics, hospitals and in some segments of the industry. In São Paulo it has radioactive garbage of the Institute of Nuclear Energy Research, in the USP, and of the Technological Center of the Navy, located in Iperó, about 20 kilometers of Sorocaba. In Belo Horizonte it has the nuclear garbage of the Center of Development of Nuclear Technology, of the old mine of Uranian of Wells of Caldas. In the Bahia also it will have to have a destination for the garbage of the mine of Uranian of Caetité, in the inland of the State, and also in Pernambuco, where he is being constructed the Regional Center of Nuclear Sciences of North and Northeast.

## 5.1 The nuclear complex - Angra 1 and 2

The garbage produced in Cove 1 and 2 can be classified in three levels of radioactivity: high, average and low. Not yet it has, in Brazil, a place chosen for the definitive deposit of the nuclear garbage, being stored in intermediate deposits. For the garbage of low and average radioactivity (that they would have to be in the intermediate deposit per in the maximum three years) the destination is two constructed sheds of concrete inside of rocks, to the side of the plant. In these sheds they are stored drums that, or contain boots, overalls and other contaminated clothes (garbage of low radioactivity, with approach stocking-life of 60 years) used for workers or metal chemical parts of the reactor and residues (garbage of average radioactivity). Most of the drums contains garbage of low radioactivity that they can, also, be reused. Segundo Kleber Cosenza, Superintendent of Angra 2 production, in a periodic inspection, the stored material passed of 1400 drums for 400, due to verify of that those objects had lost the radioactivity. Some parts of clothes had been make use of.

The reject of high radioactivity, that the industry by-product flame, is formed by the radiated combustible element already inside of the reactor. This I reject has a sufficiently long stocking-life, being able to arrive the sets of ten of thousand of years, what it becomes the question on the destination to be given much more important. By incredible that it seems, the combustible element also can be reused. Normally, it is removed of the reactor with only 15% de its used capacity. If the plant receives combustible elements with any type of problem, can appeal to the stored fuel to be used in combination with the new. The place of stockage of the garbage of high Cove radioactivity is its swimming pools. For the Angra 2 a swimming pool inside of the reactor (different of the one of Angra 1, that it is outside) with capacity was constructed to store the garbage produced for half of its useful life, 20 years. The Angra 1 swimming pool can store the residues of its 40 years of activity foreseen. Both keep the submerged residues more than ten meters of depth, being the water the used binding.

The main concerns that the nuclear energy excites are related to the risk of an accident, as the occurrence in the plant of Chernobyl, and the treatment and final disposal of its garbage. Moreover, possibilities of attempted against nuclear installations and shunting line of split material are raised. The problem of the nuclear garbage is not exclusive of the nuclear area, it is decurrent of all the activities human beings. The nuclear one has the rigorously controlled storage and the discarding, resulting in the practical one in a lesser aggression to the environment, while the other garbage they are found in any place.

However the nuclear garbage every year continue being produced, and each time more, meanwhile the deposits in some countries still are precarious and lack places to store this material. The creation of politics you would only be that they restrict the use of radioactive material and determine rigid norms will be able to hinder the multiplication of deposits of radioactive garbage, since not not yet its treatment and to use again in a exist half efficient for degree of 100% the efficiency and security. Challenge for this generation and the future ones, to find this solution, for the good of the planet and the beings that live in.

## 4. CONCLUSIONS

1. In a world that has faced of form continues the increase in the energy consumption, it is possible to use the contribution of the nuclear technology, to guarantee the supply of a viable energy, that gradually can complement and future to substitute the oil and the coal as source of less aggressive energy for environment.

2. The problem of the nuclear garbage not he is exclusive of the nuclear area, it is decurrent of all the activities human beings. The nuclear garbage have the rigorously controlled storage

and the discarding, resulting in the practical one in a lesser aggression to the environment, but not yet exists half efficient for its treatment and to use in a 100% degree of de efficiency and security.

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