

# RENEWAL OF CEA TRANSPORT PACKAGING INVENTORY

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## Abstract

In the 1970s and early 1980s, the CEA built up an impressive inventory of casks, flasks and packagings to deal with the extensive nuclear programs of that time. Since then, only a few new containers have been produced due to the restrictive budgets and the consequent program reductions.

Today, most of these packagings are more than 20 years old and do not meet all new safety regulations criteria. At present, 10% of all available casks are designed and built according to the latest IAEA safety regulations (1985).

Up until a few years ago, certificates of approval were still renewed without any major difficulty. Now, French safety authorities have become much more demanding, and it has clearly identified consequences. First, the necessity of conducting new safety studies, constituting new safety files, modifying some of the casks..., with ensuing financial costs. Second, the unavailability of certain packagings whose certificates of approval are not to be renewed, with the resulting delay in research programs.

The CEA has therefore decided to initiate the renewal of the packaging inventory to cope with this situation. But many difficulties are arising: as things are becoming urgent, the CEA must organize in order to define needs and priorities, and to find the right partners to carry out this project successfully.

## 1/ Introduction

In the 1970's, France through the CEA, had a very important nuclear research program involving the following facilities:

- fast reactors : Rapsodie, Phénix and afterwards Superphénix
- MTR reactors : Osiris, Siloe and subsequently Orphée
- Several research laboratories to study fresh fuel, spent fuel, material
- etc...

Within this context, money was not lacking and, as there was no management policy for packagings, each facility had its own casks built according to its individual needs. Therefore, until the late 1980's, the packaging inventory expanded with very little consideration for rationalization or expenses.

At present, things are different :

first, research programs are not the same and, as they are decreasing, budgets have decreased as well.

second, most of the packagings are of an old design and are no longer in conformance with the latest regulations.

third, French safety authorities have become very picky in the last few years and more than ever with recent events of contamination on spent fuel transports from nuclear power plants to reprocessing plant of La Hague.

So, the CEA had been obliged to organize a centralized management in order to optimize the use of the few casks which are still approved, to define those which are worth spending money and energy on to obtain a further approval and also to deal with safety requirements.

This paper only deals with packagings used for civil activities and does not take into account waste casks whose situation is, more or less , the same as the one described here.

## **2/ The situation today**

Including waste casks, there are nearly 60 types of packagings representing more than 3000.

The average age is 20 years.

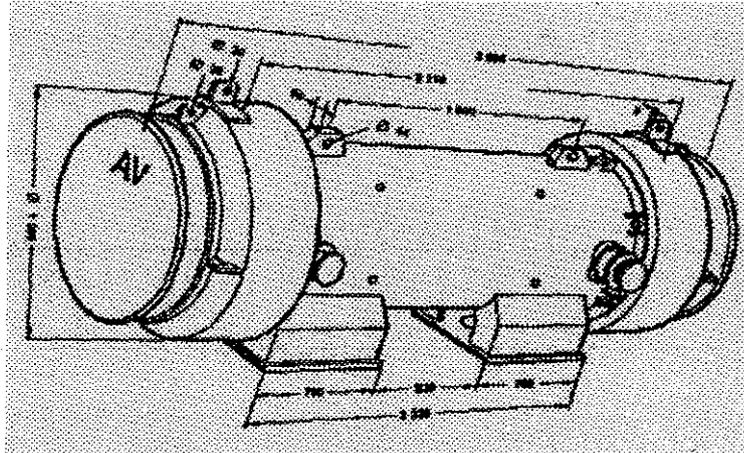
Designed according to IAEA 1973 safety regulations, there are 32 types, 2532 casks.

Designed according to IAEA 1985 safety regulations there are 6 types, 300 casks.

### **a/ « IL » packagings**

This kind of cask is very important for the CEA because it is specifically designed for spent fuel transports between laboratories. « IL » packagings are made up of :

- a steel cylindrical body with an horizontal axis
- an internal cavity with a circular section which is closed on each side by a lid
- one of these lids is equipped with a barrel, the other with a push/pull pole system
- a thermal and a lead protection
- shock absorbers at each end



There are 13 types, 28 packagings, all designed according to IAEA 1973 safety regulations. There are very few of them because they are heavy and expensive.

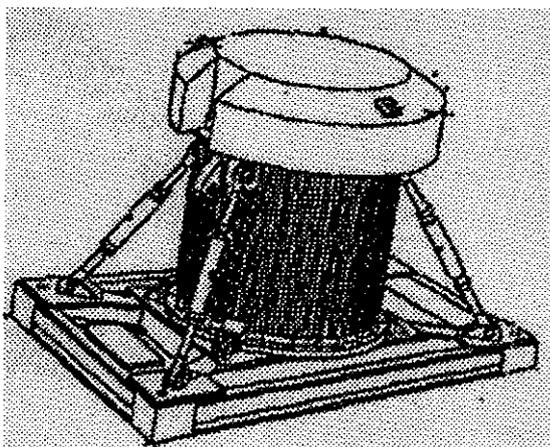
contents : any piece of spent fuel to be sent to any laboratory for analysis or reprocessing

At the end of October 1998, only one type will retain approval in force, and we are not optimistic about getting further approvals for any of these packagings. The problems pointed out by the safety authorities are their mechanical resistance (drop tests) and releasing in accidental conditions.

b/ « IU » packagings

They are designed to transport spent fuel from research reactors to disposal areas or reprocessing facilities. They are made up of :

- a steel and lead cylindrical body with a vertical axis
- an internal cavity closed on the top with a lid
- a thermal protection
- a shock absorber on the top



There are 4 types, 11 casks, and 2 types in conformance with the IAEA 1973, 2 with IAEA dated from 1985. They are heavy and expensive.

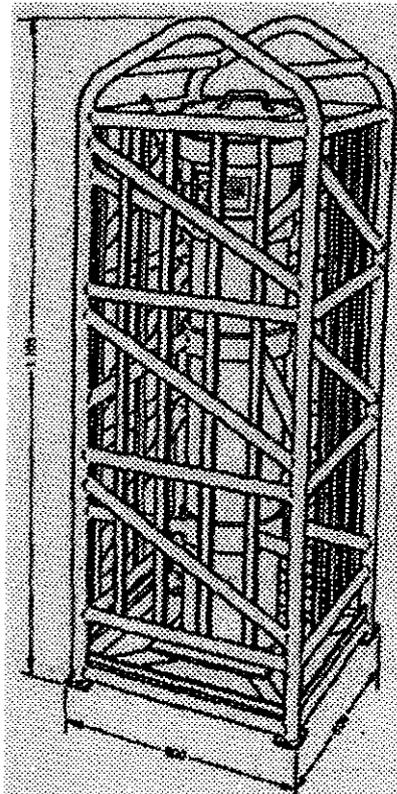
Contents : spent fuel or pieces of structures coming from research or submarine reactors.

Only one type still has the approval in force today, which will last until September 1999. The safety problems are the same as « IL » ones.

#### c/ « FS » packagings

They are designed for fresh fuel transports from disposal areas or conditioning facilities to research reactors. They are made up of:

- a steel tubular structure with, in the middle, a double shelled steel cylinder
- a thermal protection between the two shells
- an internal cavity closed on the top with a lid



There are 12 types, 2623 packagings, but only 2 types correspond to the IAEA regulations of 1985. Most of them are less than 400 kg.

Contents : any piece of fresh fuel to be burnt in research reactors (mainly uranium and plutonium).

4 types are still approved today. Most of the safety problems come from mechanical and thermal resistance, radiolysis hazards, and leaktightness.

Consequently, it is impossible to transport plutonium samples in France today under any chemical form in pellets or powders. But fortunately, it is sometimes possible to use British packagings....

In this context, safety authorities have to deal with a lot of various requests : re - agreements, special arrangements, agreement extensions etc..., their engineers are overloaded with work, and delays are growing, reaching 6, 9, or 12 months.

As for the CEA, it would have to spend a tremendous amount of money in studies, tests, modifications hoping to get new agreements on « old » packagings, but with no real guarantee of actually obtaining them.

That is the reason why the CEA has decided to build a new and modern packaging inventory.

### **3/ The renewal of the packaging inventory**

Now that the decision has been made, the most difficult remains to be done.

First, as there are many facilities in the different research centers of the CEA, each need has to be considered but the new casks will have to be as versatile and multi - purpose as possible in order to keep expenses under control. Second, everyone has his own priorities which may vary one to the other, and at the end the project leader has to make a choice.

Then the project leader has to define who, in the CEA or out of it, is going to work (studies, design, manufacturing) on the project, and which divisions of the CEA will have to pay for this work.

Of course, at the same time, he also has to deal with the budget he has been given, and with the safety authorities time periods and deadlines which are not under his control.

All these elements make this renewal a very tough task to achieve. But the project is slowly taking off and it is possible to give a piece of information about it :

A year ago this renewal had been estimated for the next five years at the amount of 50 MFF ( 5 million £).

#### **a) « FS » packagings :**

One of the « still approved packagings » is recent ( 10 years ) and therefore meets the IAEA 1985 safety regulations. It's called TNBGCI, approved for any uranium content, and will probably be approved soon for most of plutonium contents. If so, this packaging will be able to replace most of the old « FS » ones.

Consequently, the CEA does not intend to invest money in the next few years to replace any of these packagings.

b) IU 04 :

The first cask to be replaced, will be the IU 04 which some of you may know as « château Pégase ». Useful for the transport of spent fuel of research reactors in France, but also abroad, this packaging will not be approved any longer after September 1999. The CEA couldn't afford to lose the possibilities offered by this cask.

The new one, called « TN MTR », will be available next year. Designed by Transnucléaire according to IAEA 1996 safety regulations and a bit bigger than its predecessor, this packaging won't be much different from the IU 04. But, permitted contents will be more varied : thus, not only will it be able to transport spent fuel from research reactors, but it will also handle certain types of fast reactor spent fuel, the UNGG spent fuel (MAGNOX type), and spent fuel from a future research reactor that is to be built by the CEA.

c) IU 11 :

The IU 11 was built to transport 8 canisters of spent fuel rods from the fast reactor Phénix. This packaging is no longer approved, and the approval will not be renewed.

In the last two years, Phénix was stopped for technical problems. But this reactor started again last spring and it will be necessary to transport its spent fuel.

To gain time, it has been decided that the replacing cask would be based on an existing one : the IU 25. The IU 25 is rather recently designed and was built for spent fuel rods from the Superphenix fast reactor. Unfortunately, it is very heavy ( 36 t ) : too heavy for Phénix 's crane and very restricting for transports. Therefore, as Phénix's rods are shorter than the Superphénix ones, the replacing packaging will be a « short IU 25 ». It is expected to be available by the year 2000.

d) IL 47 :

This cask is, at present, the most needed in the CEA. Medium - sized ( 16 t, 4 m long) it enables transports of small quantities of any kind of spent fuel rods or pieces of rods ( $UO_2$ ,  $UPuO_2$ ), with any uranium enrichment. Its certificate of approval will expire on September 30<sup>th</sup> 1998 and the CEA is now doing its best to get a further and final « 3 year agreement » from the safety authorities. In the negotiation, CEA promised to replace IL 47 by an up - to - date packaging after the three years. Therefore, by the end of 2001, the IL 47 will be replaced by a new medium - sized « IL » packaging which will also replace the old IL 28 and IL 33.

e) Other packagings :

Of course, as you can see it in the following summary table, the CEA planned to replace other packagings, but it is difficult to manage everything at the same time and some replacements will probably be delayed with or without a temporary solution.

Summary table :

replaced packagings	temporary solution	new packagings	number of new packagings required	availability foreseen in
IU 04	IU 04	TNMTR	2	1999
IU 11		short IU 25	2	2000
IL 28, IL 33, IL 44, IL 47	IL 47	medium IL	2	2001
IL 20, IL 22, IL 29, IL 30, IL 37	TN 99 (to come)	small IL	2	2002
IL 40, IL 45, IL 46		big IL	2	2001

#### 4/ Conclusion

The process to plan and accomplish such a task is long and difficult since it deals with technical aspects, financial aspects, and the involvement of numerous partners in and out of the CEA. But it is not the first challenge that the CEA has had to face, and, assuming that we've learned the lessons from the past, we are rather confident that this project will be led under good conditions and, why not, in an economical way.