SPANISH FIFTH GENERAL RADIOACTIVE WASTE PLAN

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ABSTRACT

This paper analyses the Spanish situation according to the present legal framework and the strategies contemplated in the Fifth General Radioactive Waste Plan approved by the Spanish Government in July 1999. The safe and efficient management of radioactive wastes may be said to be guaranteed from the administrative, technical and financial points of view, with an established system which has been in force for many years and experience in its application which provides success in its operation. New deals in radioactive waste management according to the international trends could be considered in the future, mainly in the field of spent fuel and high level waste where it has been considered appropiate to postpone any decisión regarding the final management until approximately the year 2010.

GENERAL

Last 31th July 1999, the Spanish Government aproved the Fifth General Radioactive Waste Plan (GRWP), which includes a revision of all the necessary activities and technical solutions applicable throughout the period of activity of radioactive wastes, and covers an updated economic-financial study of the costs of such activities.

In general terms it may be stated that, despite awareness of the difficulties existing as regards the achievement of certain of the objectives mapped out, fundamentally in areas relating to spent fuel and high level wastes (HLW), Spain possesses a significant infrastructure for the safe and efficient management of radioactive wastes, from the administrative, technical and economic-financial points of view.

From the administrative standpoint, there is an organisation, based on a relatively far-reaching and developed legislative framework in keeping with the evolution of international regulatory requirements, that suitably contemplates and brings together the main responsibilities of the different parties involved in the process (see Fig. 1): the Government, through the Ministry of Industry and Energy (MINER), responsible for defining policies and awarding the corresponding permits and licenses; the Nuclear Safety Council (CSN), as the sole party responsible for nuclear safety and radiological protection, that reports to Parliament; ENRESA as the company responsible for radioactive waste management, and the waste producers, among which special mention may be made of 7 nuclear power plants (NPP's) with 9 reactors, the Juzbado Fuel Manufacturing Facility and some 1,300 authorised radioactive installations (RI's).

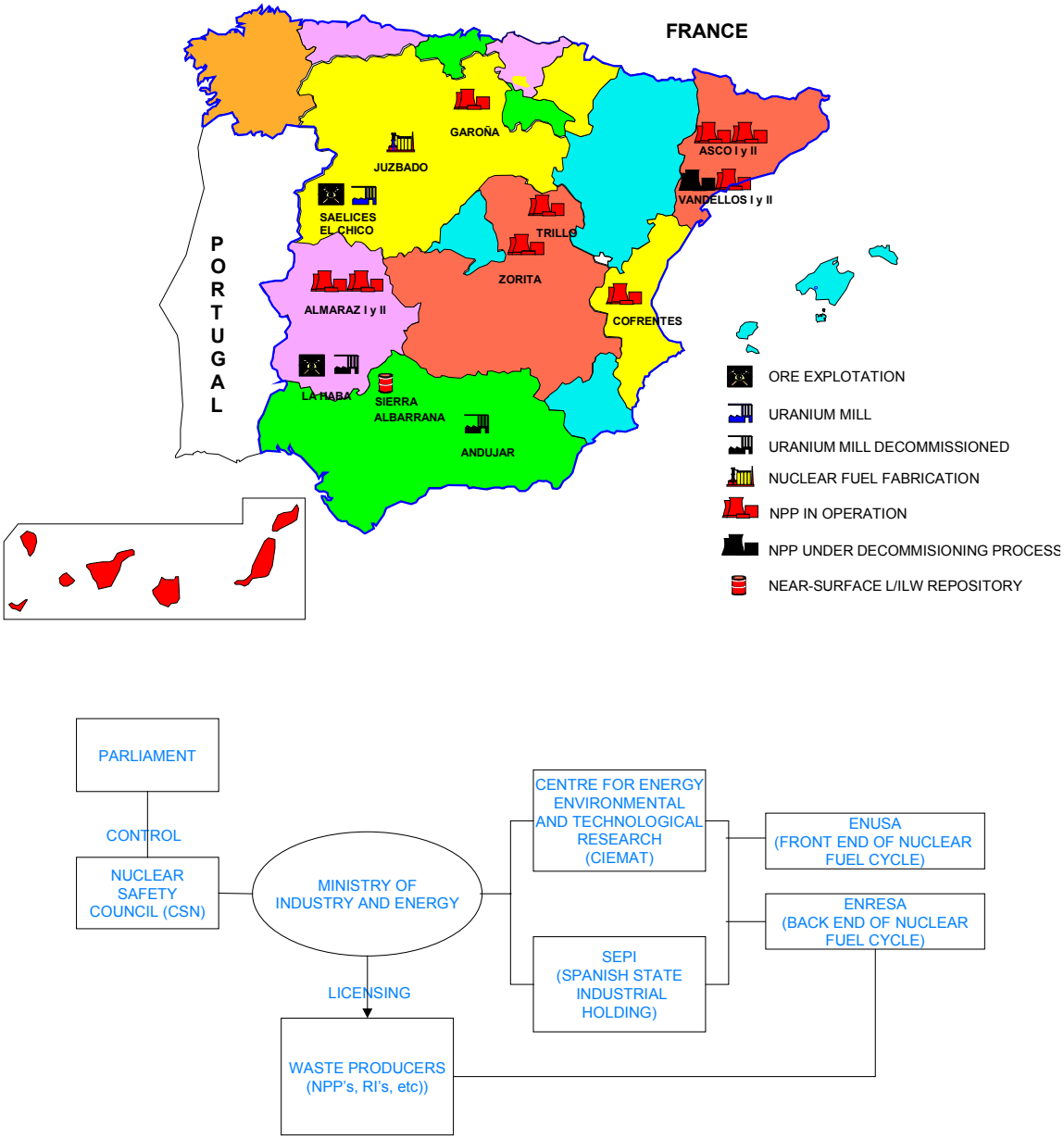

Fig. 1. Spanish nuclear fuel cycle installations and administrative organization

From the technical standpoint, are remarkable the accumulated experience during the last years and the already available technologies in different management fields, as well as the fact that the strategies and actions to be implemented are included in the GRWP's revised annually by ENRESA and, where appropriate, approved by the Government through the Cabinet.

From the economic-financial point of view, there is a system that guarantees the financing of radioactive waste management costs, based on the principle of generating funds up front, throughout the operating lifetime of the NPP's. These are collected by way of a fee, consisting of a percentage of total electricity billing.

Consequently, there is a consolidated system in place that has made it possible for Spain to develop an important capacity in waste management, with deployment of the necessary resources.

LOW AND INTERMEDIATE LEVEL WASTES (LILW)

The fundamental basis for LILW management is the El Cabril centre. This facility provides an integrated management system that includes waste collection, transport, treatment and conditioning and accurate information on the waste inventory, radiological characterisation and quality assurance, all of which is compatible with the type of disposal applied (see Fig. 2)

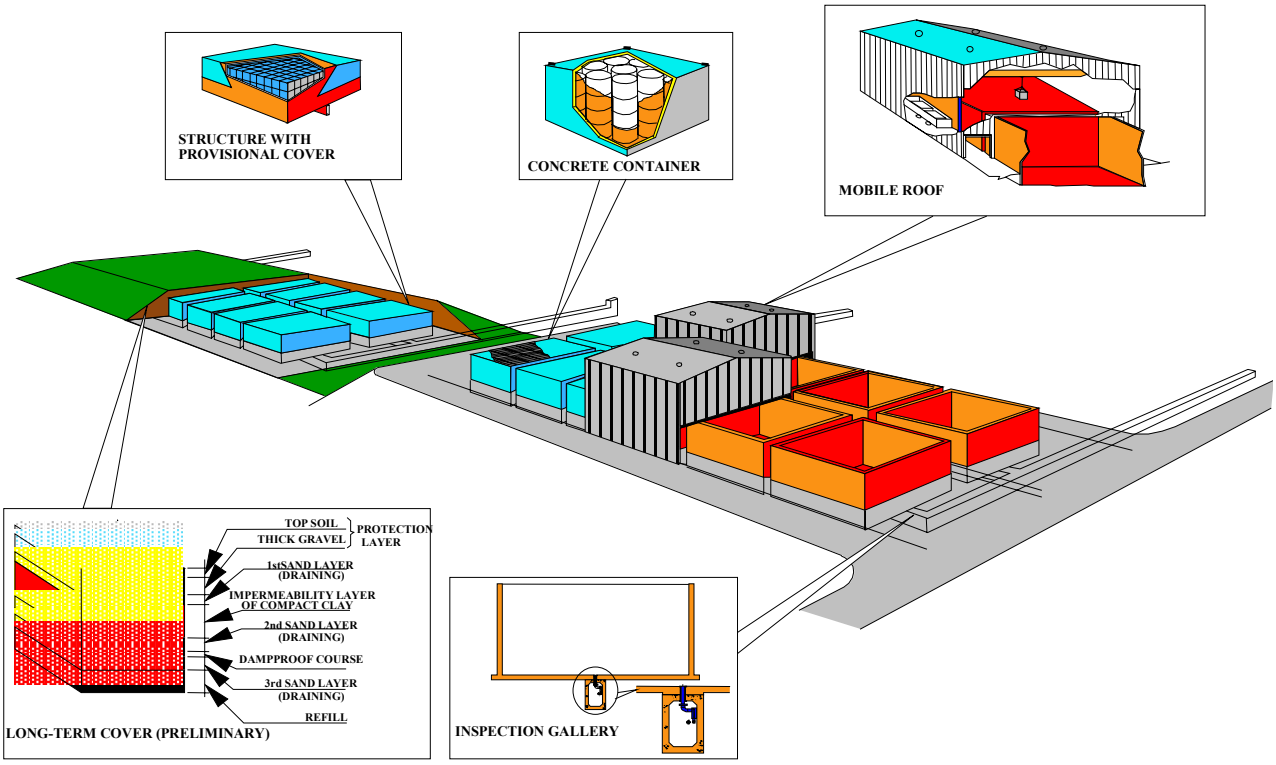

Fig. 2.- Conceptual Scheme of the El Cabril Repository

The current installations at El Cabril, together with the temporary storage facilities belonging to the producers, provide sufficient capacity for the storage of all the operating wastes from the nuclear power plants, those arising from the on-going dismantling of Vandellós I NPP and those generated by the RI's, according to current production forecasts (193.600 m^3 is the total estimated volumes of conditioned LILW to be managed in Spain, assuming 40 years for NPP service lifetime and dismantling level 3).

The fundamental activities to be performed in this field in coming years will be based on the rationalisation and possible improvement of the different processes involved in LILW management and their adaptation to future situations, along with the associated R&D projects and activities (durability of concretes, definitive covering layers, etc.) and the analysis of other aspects, such as waste volume reduction at the NPP's, an area in which highly satisfactory results

have already been obtained. In the medium term, with a view basically to undertaking the future dismantling of the NPP's, an analysis should be made also of the requirements for additional capacity for this type of wastes, which would arise at some time during the mid 2010's, in accordance with the waste collection forecasts and the current capacity of the El Cabril facility.

SPENT FUEL AND HIGH LEVEL WASTES (HLW)

Different alternatives are available for spent fuel and HLW management. Firstly, and as regards spent fuel, reference should be made to the possibilities for its being managed directly as such (open cycle) or reprocessed for recovery of the fissionable materials (U and Pu) and reuse as new fuel (closed cycle).

In Spain, the only spent fuel reprocessed has been that arising from the Vandellós I NPP and that produced by the José Cabrera and Sta. Mª de Garoña plants up until 1983. In the case of Vandellós I, use has been made of the services provided by COGEMA (France), the contract including clauses establishing the return of the HLW resulting from reprocessing as from the year 2010 (estimated 80 m^3) with heavy economic penalties for non-compliance with this date. Fr the other two plants the services used were provided by BNFL (United Kingdom); in the case of Sta. Mª de Garoña, the contracts contemplated the return of minor quantities of fissionable materials, although the dates are still pending confirmation.

Reprocessing abroad is an option that is still considered to be open, although it implies high costs and the additional problem of the wastes and other materials arising from the treatment being returned to Spain.

As regards direct management of spent fuel, (total amount estimated 6.750 tU) a further distinction should be made between two aspects: temporary storage and definitive management in the very long term.

The availability of safe systems for the temporary storage of spent fuel, based on different techniques (wet, dry), with experience of facilities already in operation in the world, will allow the possible alternatives for definitive management to be addressed in good time.

Action has been taken in Spain to increase the capacity for the temporary storage of spent fuel, such as the reracking of all the nuclear power plant pools, completed in 1998. Metallic casks have also been developed for the transport and storage of spent fuel under dry conditions.

In spite of this increased storage capacity, the pools of certain of the nuclear power plants will become saturated prior to the end of their service lifetime. This problem will arise first at the Trillo plant, as a result of which - in order for the plant to be able to continue in operation following saturation - a temporary store is to be constructed on site, in which the spent fuel will be stored in metallic casks of the type described above. These casks have already been licensed for this plant and are currently in the manufacturing phase. The target date for operation of this facility is the year 2002.

In the medium term, and in view of the fact that the pools of the other plants will become progressively saturated as from the year 2013, different options are being contemplated for the temporary storage of their spent fuel. These options are based on the construction of individual temporary storage facilities (ITS's) at the plant sites, as in the case of Trillo, as saturation occurs, and on one or more centralised temporary stores (CTS's) servicing various plants, preferably located close to one another in order to simplify transport operations.

Likewise, and quite apart from the management of spent fuel, a solution must be found to the issue of managing the high level, long-lived wastes coming from different sources, such as reprocessing, dismantling, radioactive installations, etc., which it will not be possible to store at El Cabril. In this respect it will be necessary to have at least a CTS. The target date foreseen in this Plan for start-up of this facility is the year 2010.

As regards the definitive management of spent fuel and HLW, something of a delay may be appreciated at world level in the deep geological disposal (DGD) programmes, along with growing attention to new technologies such as Separation and Transmutation (ST), by means of which it might be possible to reduce the volumes or radiological inventories of the wastes to be disposed of.

However, even though these new technologies may be developed successfully in the future, there is currently some consensus in the different international forums as regards the need for them to be considered complementary solutions, and not an alternative to DGD, which will always be necessary for the management of remaining high level wastes.

Bearing in mind the aforementioned considerations regarding definitive solutions, and the current availability of safe technologies for temporary storage, the consensus is that in Spain it would be appropriate to postpone any decision regarding the final management of these wastes until approximately the year 2010. Meanwhile, work should continue along the two aforementioned routes towards progress: DGD and Separation-Transmutation, promoting tracking of and proportionate participation in the most important international programmes, such that in view of the results obtained from technological developments the Government might at that time be provided with the information required for decision making and with the basic capacity necessary for their implementation.

Consequently, the decision has been taken to paralyse activities relating to the search for sites for a future DGD facility in Spain, to maintain the technological capabilities developed to date and to adapt R&D activities to the new approaches.

It should be pointed out that any action in this field will require the furthest-reaching communications campaigns possible, with a view to providing the public with whatever information might be necessary; this is especially important because of the high level of social sensitivity to issues relating to radioactive wastes.

DECOMMISSIONING OF INSTALLATIONS

Spain occupies a leading position at international level in this field since decommissioning projects have already been performed in relation to uranium mills (Andújar and La Haba), the rehabilitation of disused uranium mines is currently in the final phase and dismantling of the Vandellós I Nuclear Power Plant is now under way.

The aim of the Vandellós I NPP dismantling project is to release 80% of the site during the initial phase (Level 2). Following a waiting period of some 30 years, which will allow the levels of radiation to decrease significantly, the dismantling of the remaining parts, basically the concrete structure or shroud housing the reactor, will be addressed under more favourable conditions (Level 3). (See Fig. 3)

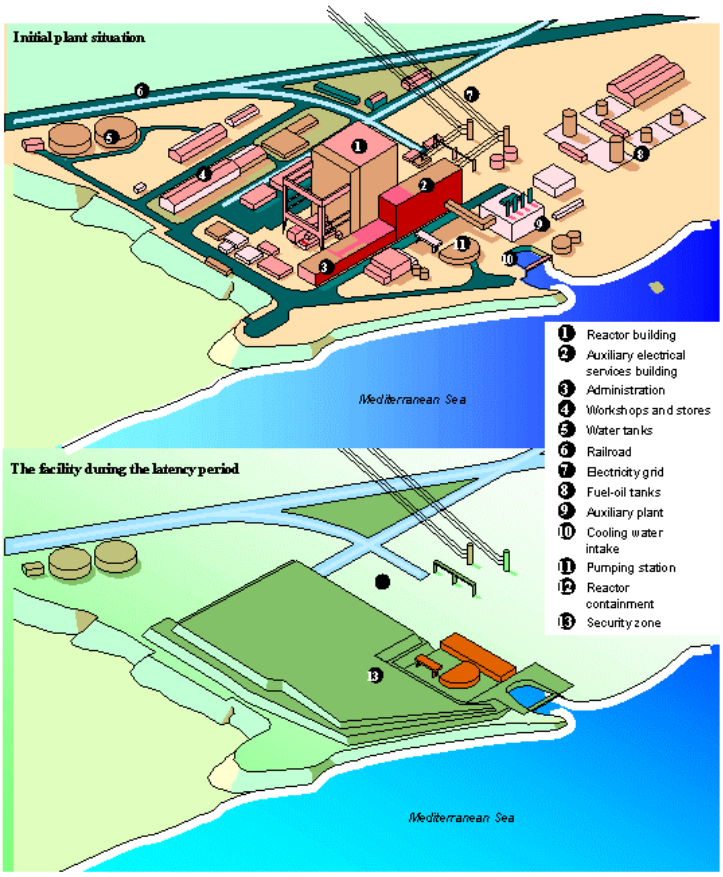

Fig. 3 Initial and latency period situation of the Vandellós I plant

For the purposes of calculation and planning, the alternative of total dismantling (Level 3) is considered for the other nuclear power plants in Spain, currently in operation. This will be initiated 3 years after the definitive shutdown of the reactors and following removal of the spent fuel from the plant pool and of operating LILW.

In view of the hypothesis adopted in this Plan for a service lifetime of 40 years for these plants, also for the purposes of calculation and planning, it will not be necessary to undertake their dismantling in the near future. Meanwhile, specific studies and research work will be carried out in order to gain deeper insight into these activities. In this respect, the experience acquired at Vandellós I NPP will be of great interest. It will also be necessary to progress in the establishment of clearance criteria for certain waste materials having radioactive contents, for their subsequent management as conventional wastes.

One way or another, it should be pointed out that only those countries having the technological resources and capacity required to adequately address the management of low and intermediate level wastes and the management, at least temporary, of their spent fuel, will be in a position to address the dismantling of their nuclear power plants with guarantees of success.

ECONOMIC AND FINANCIAL ASPECTS

Finally, from the economic-financial standpoint, and on the basis of the scenario and the hypotheses contemplated in the present GRWP, the total cost of management up to the year 2070 amounts to some 1,630,000 million pesetas (1999 pesetas), the most significant items being spent fuel management and the dismantling of the nuclear power plants (see Fig. 4). The costs incurred as of the end of 1998 represent 17% of the total cost.

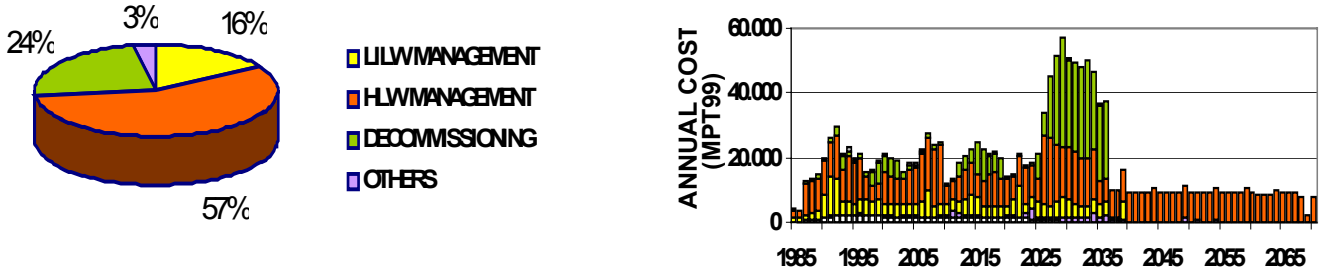

Fig. 4 Cost of spent fuel and radioactive waste management

Taking into account future costs and the Fund available at present, the quota to be applied to electricity billing throughout the operating lifetime of the NPP's will be similar to that currently in force (0.8%), considering a discount rate of 2.5%. The income obtained via the quota and the financial yield generated by Fund surpluses guarantees the financing of management costs at all times. Nevertheless, this quota is revised annually in order to take into account the possible variations arising as a result of new estimates of future costs or of the discount rate.