WASTE MANAGEMENT IN FRANCE: OPERATIONS AT COGEMA'S UP3 REPROCESSING PLANT AND OTHER KEY EVENTS

J.L. Ricaud, Vice President
H. Delaunay, Deputy Director
Reprocessing Division
COGEMA

ABSTRACT

Nuclear waste management in France has been integrated into a comprehensive nuclear fuel cycle strategy that seeks the best available technology while leaving room for future technological advances. The strategy associates the R & D establishment, the nuclear industry and the public, through the legislative process, in meeting waste management program goals. Three recent events are the cornerstones of this strategy :

- the commercial start-up of COGEMA's UP3 reprocessing plant UP3 at La Hague;
- the enactment of legislation on high-level and long-lived waste management and disposal by the French Parliament ; and
- the start-up of a second low-level waste disposal facility by ANDRA at the Centre de l'Aube.

This paper will review these major achievements which, together with the continuing excellent safety record of EDF's reactors, have made it possible to pursue the nuclear power program under good safety, economic, environmental and public acceptance conditions.

INTRODUCTION

Spent fuel has never been called "waste" in France, quite the opposite. Reprocessing has always been central to our strategy, because we believe that the recovery of fissile materials from spent fuel is a sensible course of action regardless of the circumstances. In the burgeoning growth of the nuclear power program in the late 1970's and in the 1980's, plutonium recovered through reprocessing was earmarked for the fast breeder reactor program then still in its infancy. Although the pace of growth has slowed, reprocessing continues to supply valuable uranium and plutonium that can be recycled into light water reactors (LWR). After all, a single ton of "spent" fuel is still worth 22,000 tons of oil equivalent !

Burning plutonium in a LWR to generate electricity is a productive way of storing it while keeping options open for the next generation of reactors, expected to make their French debut in the 2015-2020 time frame. We believe that these new reactors will be highly efficient in burning plutonium, and we are saving plutonium for them.

Regardless of the need for plutonium, we must ask ourselves if burying plutonium in the ground is environmentally acceptable. It seems obvious to me that no nuclear nation believes this to be the case, as none has embarked on irreversible disposal of plutonium. Rather, interim solutions, retrievable storage facilities and deferred decisions are the order of the day.

Two Years of Operations at UP3 : Lessons and Prospects

The UP3 plant at La Hague first began active operations, except for the head-end facility, in November 1989, and was fully commissioned in August 1990. Since then, the plant has enjoyed an excellent performance record, with 576 metric tons of spent fuel already reprocessed as of the end of 1991, and with all the major performance criteria having been satisfied relating to :

- products quality ;
- volume and quality of waste ;
- occupational exposures, and
- activity releases.

Actual operating results compare favorably in all cases with anticipated results or established specifications. For example, the recovery yield of uranium and plutonium is greater than 99%, with excellent product decontamination figures. In addition, the operating personnel exposures decreased by a factor of 20 compared to 15 years ago, to levels in the range of 0.3 man.mSv/MWe.yr. At the same time, activity releases to the sea continue to be much lower than authorized release thresholds, with beta gamma activity, excluding tritium, less than 10,000 Ci, or 3‰ of the total beta gamma activity in the plant. Perhaps the most interesting result is the volume of waste generated by UP3, shown in Table I.

Based on these encouraging results, COGEMA has established some exciting new short to mid-term goals. The first step, beginning around 1995, calls for reducing the volume of waste to be disposed of in deep geologic formations to less than 1 m^3/tU, by using available technologies and processes such as evaporation and eliminating bitumen waste forms. The second step, to occur around the turn of the century, aims at further reductions to around 0.5 m^3/tU, to be achieved primarily through more effective solidification of hulls and end-fittings.

The Nuclear Waste Bill

We have had a very profitable experience in the last two years, one which involved all of the parties interested in France's nuclear waste management policy, and which resulted in a nuclear waste bill that will govern waste management policy for the next 15 or 20 years or more. During the late 1980's, ANDRA, the national nuclear waste management agency, conducted exploratory work for a deep geologic

TABLE I

Volume of Conditioned Waste Per Unit of Reprocessed Fuel
(for a nominal production of 800 t U/year)

Category of waste		Specifications	Cond'd waste	Cond'd method
Deep underground disposal	Fission products	130 l/t U	115 l/t U	Glass matrix
	Hulls & ends fittings	600 l/t U	600 l/ t U	Concrete
	Sludges	630 l/t U	450 l/t U	Bitumen
	Technological wastes	1700 l/t U	200 l/t U	Grouted asbestos
Surface disposal	LL technological waste	3800 l/t U	1400 l/t U	Grouted fiber concrete overpack
As can be seen, total waste must not exceed 3 m^3/tU according to the specifications, yet actual volumes are less than 1.5 m^3/tU.				

repository of high-level, long-lived waste at four candidate sites with different host formations : granite, salt, clay and schist. As a result of local opposition at several of the sites, the French Government imposed a moratorium on any further exploration in February 1990, pending Parliamentary debate on the issue and passage of nuclear waste legislation. In 1990 and 1991, in-depth studies on the issues were conducted by the Parliamentary Office for the Assessment of Science and Technology, as well as by various committees of experts and public representatives such as the Technological Risk Prevention Board and the High Council for Nuclear Safety and Public Information.

The various viewpoints of the interested parties were given a forum in public hearings in which local public interest groups, labor unions, environmental defense groups, the nuclear industry and the administration participated.

At the end of last year, the process culminated in proposed legislation, which was debated by both Houses of Parliament - the National Assembly and the Senate - and which was passed as the Radioactive Waste Management Research Bill on December 30, 1991. The legislation provides for the construction of at least two underground laboratories to assess the performance of geologic formations for the disposal of high-level, long-lived waste. At the same time, the Bill sets forth the conditions for continuing R & D efforts in the waste management arena, and requires that an annual progress report be submitted to Parliament. The reports are to be prepared by a National Assessment Committee, made up of technical experts and public representatives, and will be made public. A Global Assessment Report on the results of research is to be submitted to Parliament by the Government within a maximum period of 15 years, accompanied by proposed legislations for transformation of the laboratory into an actual repository for the high-level, long-lived radioactive waste.

The present Bill also contains certain provisions relative to the site selection process for the underground laboratories, including the creation of local review committees and provisions for financial and industrial assistance for the development of the host communities.

Finally, the Law changes ANDRA's statute to that of a "Public and Commercial Establishment", completely independent of the CEA group structure, and reporting directly to the Ministries of Industry, of Research, and of the Environment.

The enactment of the Waste Bill paves the way for restarting the siting process for the underground laboratories, and makes French waste management policy an open and publicly controlled process. A few local communities have already expressed interest to host a laboratory.

Start-Up of ANDRA's Centre de l'Aube Low-Level Waste Disposal Facility

On January 13, 1992, the first shipment of low-level waste was received at ANDRA's Centre de l'Aube disposal facility near Soulaines, 200 km east of Paris. Since this subject will be covered in detail in a separate paper to be presented at this conference, I will only briefly mention a few points :

- The Centre de l'Aube is the second disposal facility to be sited in France, and will gradually replace the Centre de la Manche, which has operated since 1969 and is scheduled to close in 1994-95. The Centre de l'Aube will operate for a minimum of 30 years, and has a total waste disposal capacity of 1,000,000 m^3.
- Experience from operations of the Centre de la Manche has been used extensively in the design and operation of the second facility, which also brings new design approaches and a more thorough waste acceptance process into play.
- ANDRA, the national radioactive waste management agency, has spent a total of 1.3 billion French francs over a period of 8 years to develop the Centre de l'Aube. The project was financed by ANDRA's clients EDF, COGEMA, CEA and other waste generators in the defense, industry and research sectors.
- The primary objective of radioactive waste disposal in France is clear: to isolate the waste from the biosphere and to protect it from human intrusion for as long as necessary for the radioactivity in the waste to decay to an acceptable level. Waste acceptable for disposal at the Centre de l'Aube may contain radionuclides with half-lives not exceeding 30 years, which will decay by a factor of 1000 after 10 periods or 300 years, and which will be essentially negligible at that time, allowing the site to be released for unrestricted access. The waste must therefore be isolated for a period of 300 years, which is the time frame selected

for the monitoring or institutional control period, after which time access to the site will be unrestricted.

- The open attitude and public involvement fostered by ANDRA in siting the Centre de l'Aube facility resulted in a high level of acceptance of the facility by the local communities. ANDRA provided financial assistance to local development projects in the neighboring communities, and planted trees equivalent to those felled at the site on land it purchased for that purpose. A Local Information Commission established seven years ago and made up of community and Parliamentary representatives, the media and professional associations has worked steadily to channel needed information to the public and to respond to their concerns. The Centre de l'Aube receives thousands of visitors every year, mainly from the Aube region but also from overseas.

CONCLUSION

Recent events in France in the area of spent fuel and waste management show rather clearly, I believe, that our nuclear power program is proceeding smoothly and under good conditions with respect to safety, commercial competitiveness, environmental protection and public involvement. The back end of the fuel cycle, which may be a bottleneck to the development of nuclear power in some countries, is being treated correctly in France. Our guiding philosophy, one that is shared by all those involved in the program, is that instead of strangling development while pretending to wait for future breakthroughs, we are implementing available solutions today in order to continue our path of progress to the future.