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ORNL
FOREIGN TRIP REPORT
ORNL/FTR-2157

DATE: October 25, 1985

SUBJECT: Report on Foreign Travel of U.S. Department of Energy Delegation to Paris, France

TO: Herman Postma

FROM: ORNL Team Members: L. J. Mezga and R. H. Ketelle (Energy Division), F. G. Pin (Engineering Physics), and S. D. Van Hoesen (Engineering Division)

PURPOSE: To attend the fourth joint workshop under the auspices of the U.S. Department of Energy/Commissariat a l'Energie Atomique Radioactive Waste Management Agreement of July 1983 on the topic of "Low-Level Waste Disposal Facility Siting and Site Characterization," including a visit to the waste management facilities at the Centre de la Manche at Cherbourg.

SITES VISITED:

10/1/85	ANDRA (Agence National pour la Gestion des Dechets Radioactifs)	Paris, France A. Barthoux
10/2/85	Centre de la Manche (ANDRA)	Cherbourg, France Y. Marque
10/3/85	SGN (Societe Generale pour les Techniques Nouvelles)	Montigny - Le- Brettonneux H. de la Bassetiere

ABSTRACT: A U.S. team consisting of representatives of Oak Ridge National Laboratory (ORNL), Savannah River Plant (SRP), Savannah River Laboratory (SRL), and the Department of Energy Office of Defense Waste and Byproducts Management participated in the fourth meeting held under the U.S./French Radioactive Waste Management Agreement between the U.S. Department of Energy and the Commissariat a l'Energie Atomique. This meeting, held at Agence Nationale pour les Gestion des Dechets Radioactifs' (ANDRA's) Headquarters in Paris, was a detailed, technical topical

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workshop focusing on "Low-Level Waste Disposal Facility Siting and Site Characterization." The meeting also included a visit to the Centre de la Manche Waste management facility operated by ANDRA to discuss and observe the French approach to low-level waste management. The final day of the meeting was spent at the offices of Societe Generale pour les Techniques Nouvelles (SGN) discussing potential areas of future cooperation and exchange.

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Foreign Travel Report

The following trip report was prepared by Messrs. James E. Dieckhoner (DOE/HQ) and Lance J. Mezga (ORNL) as a team trip report and represents the activities, findings, and recommendations of the U.S. Department of Energy Delegation to the joint DOE/CEA topical workshop on "Low-Level Waste Disposal Facility Siting and Site Characterization" held in Paris, France on October 1-3, 1985. The following sections provide details of the visit, a summary of impressions, and recommendations and conclusions regarding relevance of information gained to waste management in the United States.

Technical Session on Low-Level Waste Disposal Facility Siting and Site Characterization

On October 1, 1985, the U.S. Department of Energy (DOE) delegation held a meeting at ANDRA's headquarters office in Paris to discuss low-level radioactive waste management experience, current activities, and future plans. A copy of the agenda is provided as Appendix III. Copies of abstracts of the DOE and ANDRA presentations are included in Appendix IV. The ANDRA presentations are summarized in the following paragraphs.

Mr. A. Barthoux welcomed the U.S. DOE participants and briefly described ANDRA's responsibilities and the general scope of its current activities relative to those of the waste generators. ANDRA is responsible for management of the transportation of wastes from the generator to the disposal site, any additional conditioning of the waste prior to disposal, any temporary storage at the disposal facility, final disposal, and quality control for the entire waste management system. They receive about 30,000 m^3/yr of waste; about 18,000m^3/yr or 60 percent from Electricite de France (EdF) power plants, about 10,500 m^3/yr or 35 percent from COGEMA, about 3,000 m^3/yr or 10 percent from CEA laboratories, and the remaining 1,500 m^3/yr or 5 percent from other sources. About 90 percent of the waste is received in drums, 5 percent as concrete blocks, 3 percent as packaged air filters, and 2 percent in iron boxes. (This last category is rapidly growing.) ANDRA transuranic (TRU) waste concentration limits are 0.1 Ci/MT for individual packages (about 100 nCi/gm) and 0.01 Ci/MT from a total site perspective (about 10 nCi/gm). At the present time ANDRA is attempting to site a new disposal facility to replace the Centre de la Manche. The schedule calls for completion of the Environmental Impact Report in 1986, site qualification in 1987, construction in 1988, and operations beginning in 1990.

Mr. Y. Marque then gave a more detailed briefing on the history and specific activities at ANDRA's currently operating facility (Centre de la Manche), which has been operating since 1969. The 12.1 ha facility is located on Cape La Hague near Cherbourg and is located adjacent to the COGEMA reprocessing plant. The area receives approximately 101.6 cm of precipitation per year. Construction began in 1967 with actual operations beginning in 1969. Since that time, approximately 250,000 m^3 of waste have been disposed of at the Centre de la Manche.

Initially, ANDRA employed simple shallow land burial (i.e., trench with gravel base, packages of drums, plastic bags, and 2 m^3 concrete blocks, soil fill, plastic barrier, and soil cover). In 1970 they required concrete walls and floors. The drums of waste were backfilled with sand or concrete in the trenches. In 1973 they had several Cs-137 contamination incidents resulting from bad packaging of PWR sludges. In 1974 they had some alpha contamination of operating personnel. In 1976 they detected tritium contamination of Ste. Helene Creek, a surface stream which eventually leads to the ocean; the level detected was about 10 times background. The source of the tritium was iron boxes in the concrete-walled trenches. Rainwater apparently got into the waste before the trench was sealed. The French safety authorities asked ANDRA to change their mode of operation; first to stress the quality assurance (QA) of packages coming from the generators and second, to develop a system to detect contamination before it gets out.

In 1979, ANDRA initiated its current "monolith and tumulus" system of disposal with an extensive water collection and monitoring system. The primary emphasis is on having (1) no release of effluents, and (2) a strengthened QA system. ANDRA has established concentration limits for the acceptance of waste by individual isotope for both stabilized (i.e., embedded in concrete) and nonstabilized waste. These are provided in Table 1.

The alpha and beta-gamma limits were derived based on an individual dose of 10 mrem/yr using conservative performance assumptions. ANDRA obtains estimates from the waste generators of what waste they will be sending. ANDRA then compares that with the source terms used in their site performance model. For beta-gamma waste, the water pathway is considered controlling; for alpha waste, the airborne pathway is controlling.

ANDRA is concerned with three periods for its site: (1) the operational period during which waste is emplaced; (2) the survey period during which access is limited, the final cover is emplaced, and surface water is controlled; and (3) the free-use period when no control is assumed. The survey period is not assumed to be more than 300 years. Impacts of accidents involving beta-gamma waste are

Table 1. Concentration limits for waste acceptance (Ci/MT)

Radionuclide	Unsolidified Waste Form	Solidified Waste Form
^{3}H	0.2	2
^{60}Co	0.1	1,300
^{90}Sr	0.1	20
^{137}Cs	0.1	130
alpha	not applicable[a]	not applicable[a]

[a]Total alpha limit per package - 0.1 Ci/MT (approximately 100 nCi/gm); per site -- 0.01 Ci/MT (10 nCi/gm).

calculated to occur at 150 years, in the middle of the survey period. Alpha accidents are calculated after 300 years. The final cover is expected to allow only 1 liter of water to infiltrate per 1 m^2 of surface, given a precipitation rate of 1 m^3/m^2 of surface.

Mr. H. Nouguier then described ANDRA's overall QA program. ANDRA's procedures for establishing waste acceptance criteria are summarized as follows: (1) safety objectives are defined by another federal group; (2) ANDRA defines technical alternatives to meet the objectives and proposes them to the safety authorities; (3) on receipt of approval from the safety authority, ANDRA drafts a safety report; (4) on approval of the safety report, ANDRA develops specifications based on the safety report; (5) the specifications are then placed on the waste generators who develop the processes and qualification tests to meet the specifications which are documented in process books; and (6) eventually an agreement between the generator and ANDRA is finalized. ANDRA must approve and validate all of the procedures and processes.

Mr. Nouguier discussed estimated disposal costs which are summarized in Table 2.

Ms. Andre-Jehan described the process ANDRA has used to identify its next site. They decided to start the search for a new site in 1982. In 1984 the fundamental safety rules were established. They have three steps in their process: (1) preparation of an inventory of possible sites; (2) investigation of potential sites; and (3) qualification of the final site. ANDRA generally considered all of France in its survey of possible sites. However, efforts quickly focused on sites underlain by sedimentary rocks because of the difficulty in modeling fractured igneous rocks. Efforts focused on four regions: (1) the Paris Basin, (2) the Aquitaine Basin, (3) the Rhone Valley, and (4) the area around Brest. These broad

Table 2. Disposal costs

Type of Work	Cost ($/m^3)
Contact-handled solidified LLW	300
Contact-handled solidified ILW	500
Contact-handled unsolidified LLW	425[a]
Contact-handled unsolidified ILW	600[a]
Remote-handled solidified ILW	950

[a]The cost for unsolidified wastes is higher than that for solidified wastes because it reflects costs for treatment/processing/repackaging of the waste at the Centre de la Manche.

areas were identified for information gathering in 1984 using infrastructure and institutional criteria. In addition, two local communities volunteered to host the facility. Further analysis of the sites led to an announcement of the location of the proposed site about a month ago. ANDRA hopes to have the new site operating by 1990.

Mr. A. Faussat explained the very extensive public interaction/involvement program ANDRA has implemented and continues to carry out to assure local acceptance of its proposed site. The local area will benefit from the new site. They will receive a grant of $3.5M during the construction period, about $0.2M/year in taxes, and the site will provide about 70 direct and 70 indirect jobs. Mr. Faussat described the strategy for gaining local acceptance for the facility. ANDRA works hard to develop strong local support. Initial and continuing contact was made through the newspapers and social groups. Civic leaders were identified and efforts focused on educating and informing them. A local information office was established and a series of information briefings and public meetings were held. In addition, civic leaders were taken to the Centre de la Manche for a tour of the facility. Two key elements of their program are: (1) to explain "why they do what they do" first and "how they do it" second, and 2) to focus on the "key" people in the community rather than trying to convince the entire population.

Visit to the Centre de la Manche

On October 2, 1985, Mr. Marque conducted a very thorough tour of the ANDRA low-level waste (LLW) site at Centre de la Manche. As the site is nearing its capacity, ANDRA is attempting to utilize all available remaining space. Earlier it had retrieved all the waste that had been the cause of the earlier tritium release as well as the waste disposed

of by shallow land burial. It then constructed monoliths and tumuli in those areas. ANDRA will soon decide whether to exhume the waste disposed of in concrete-lined trenches.

We were taken on a tour through the underground water collection and sampling system. At this site, infiltration and runoff water are collected together. The design of the new site will include temporary covers to eliminate rainwater from entering the disposal areas before they are covered. ANDRA plans to replace part of the old water collection system with a new system, which will be contained in an underground gallery. The final cover will then be extended to the edge of the site.

Neither the current nor the proposed site employ a buffer zone. They use all of the area up to the perimeter fence and see no purpose in using space for a buffer area since they located and designed the site to operate within their performance criteria of 10 mrem/yr.

ANDRA is extremely proud of its site, its performance, and its mode of operation. They conduct extensive tours of the site and maintain a very well staffed visitors center. Representatives of the local area, as well as representatives of areas of possible new sites, are given tours of the Centre de la Manche.

The site includes a cement stabilization facility. Generators can ship their waste to the site in standard metal containers and ANDRA will add the immobilizing cement, or the generators can do their own immobilization. A 5 m^3 box can be filled with cement in about 15 minutes. If ANDRA performs the immobilization, then it is considered the "generator." As a generator it must provide adequate documentation (i.e., prepare an approved "process book"), and the operation is subject to ANDRA's independent QA audits and inspections.

The site also includes a compacter that was being modified to automate the input and output of waste to reduce operational exposure. The compacted drums are placed in a concrete container and immobilized with cement. All waste at the site must be immobilized.

Technical Follow-Up Discussions at Societe Generale Pour Les Techniques Nouvelles (SGN)

On October 3, 1985, the U.S. DOE delegation met with ANDRA and SGN at SGN's headquarters outside of Paris. The purpose of this meeting was to review what both sides had heard on Tuesday, to review what was learned from the site tour on Wednesday, and to investigate possible follow-on activities.

SGN personnel described how they fit into the overall ANDRA and CEA organization and their experience in several other areas of interest related to waste management. SGN is a design engineering firm

employing approximately 1,335 people. They develop major designs for waste management facilities such as the Center de la Manche and spent fuel reprocessing facilities. In the overall scheme of management at la Manche, CEA is responsible for research and development and licensing of the facility; ANDRA is responsible for operations; and SGN is the design and engineering contractor. Examples of their work include design of the vitrification plant at the British Nuclear Fuels, Limited's (BNFL) Sellafield facility; the bitumenization process implemented at Sweden's nuclear plants; the monitored retrievable storage facility in Sweden; and spent fuel reprocessing facilities in France, Belgium, and Japan.

SGN also discussed the scope of the recent activities and where they think SGN could be of assistance to the USDOE. It was made clear to them that the DOE delegation did not come on this trip to solicit any proposals but rather to learn of ANDRA's activities in LLW management and, specifically, to become more familiar with operations at Centre de la Manche. Discussions were held on the topics of waste form and the disposal site design for the Oak Ridge National Laboratory. A copy of the SGN-prepared discussion points is provided in Appendix V.

Discussions were also held concerning the alternate ways in which ANDRA/SGN could possibly become involved with waste management activities at either ORNL or Savannah River Plant. These ranged from personnel exchanges under the CEA/DOE bilateral agreement, funded assistance under a specific implementing agreement under the bilateral agreement (e.g., the CEA involvement at West Valley), and various direct contracts through the ORNL. A copy of the implementing agreement between CEA/SGN and DOE is provided in Appendix VI.

Conclusions and Recommendations

The visit of the USDOE team was very beneficial to DOE Headquarters, ORNL, and Savannah River. Since the ANDRA operation at Centre de la Manche is well known in the United States, DOE and its contractors must be knowledgeable about it as they propose new LLW sites.

QA procedures, audits, and inspections in the management of LLW are obviously a high priority for top-level management within ANDRA. While this area is receiving attention in DOE's TRU waste program (e.g., Waste Isolation Pilot Plant Waste Acceptance Criteria, site storage criteria, etc.), it has not received as much attention within DOE's LLW program. This situation must change as new DOE LLW sites are proposed, designed, constructed, and placed in operation. Rather than waiting for other agencies or reviewers to suggest, request, or demand the establishment of a stronger QA program, we should insist that it be initiated at the inception of any new site development activity.

An arrangement should be pursued with ANDRA to obtain documentation of the establishment, evolution of operating practices, controls, and proposed closure activities at Centre de la Manche. A referenceable document would be helpful in both planning new DOE facilities and in responding to inquiries, comments, etc., comparing proposed DOE LLW disposal actions to those of ANDRA.

Other areas of potential useful interaction include the design and demonstration of an above-ground engineered disposal facility as is being planned at Oak Ridge.

Appendix I

Trip Itinerary

September 28-29, 1985	Travel to Paris, France
September 30, 1985	Pre-meeting organization and coordination meeting, Paris, France
October 1, 1985	Technical Topical Workshop at ANDRA, Paris, France
October 2, 1985	Visit to the Centre de la Manche, Cherbourg, France
October 3, 1985	Close-out meeting at SGN, Montigny-Le-Brettonneaux, France
October 6, 1985	Travel to Knoxville, Tennessee

Appendix II

List of Contacts

ANDRA

A. Barthoux
Y. Marque
H. Nouguier
R. Andre-Jehan
A. Faussat
Mdme. Kinski

SGN

H. De La Bassetiere
C. Hutchison
B. Vigreux
J. P. Conord
M. Lung
P. B. Roux
J. Merlet

Appendix III

Agenda

CEA/DOE WORKSHOP ON LOW-LEVEL WASTE SITING AND CHARACTERIZATION

PARIS-October 1-3, 1985

GENERAL AGENDA

Tuesday October 1st

ANDRA Headquarter 69 quai de Grenelle 75015 PARIS

9:00 AM	Welcome
9:15	French presentation and discussion according to annex 2
12:30 PM	Lunch
2:00	US presentation and discussion
5:15	Adjourn

Wednesday October 2nd

Visit of Centre de la Manche Low-Level Waste Disposal

7:10 AM	departure ORLY OUEST airport
8:25	landing CHERBOURG airport
9:30	arrival to centre de la Manche - Visit, discussion, lunch
5:30 PM	leaving Centre de la Manche
6:55	departure CHERBOURG airport
7:20	landing ORLY OUEST airport

Thursday October 3nd

SGN Headquarter 1 rue des Hérons 78184 MONTIGNY-LE-BRETONNEUX

9:30 AM	departing from hotel by car
10:00	arrival SGN headquarter
	General discussion
12:15 PM	Lunch
14:30	return to PARIS
15:00	Adjourn

CEA/DOE WORKSHOP ON LOW-LEVEL WASTE SITING AND CHARACTERIZATION

TOPICAL AGENDA OCTOBER 1st

FRENCH PRESENTATION

9:00 WELCOME
A.BARTHOUX
DEPUTY DIRECTOR OF ANDRA

9:15 OPERATING EXPERIENCE FROM CENTRE DE LA MANCHE
Y.MARQUE
PROJECT DIVISION HEAD

10:00 PROGRESS MADE IN SELECTION AND CHARACTERIZATION OF NEW LLW DISPOSAL SITES
R. ANDRE-JEHAN
SITE DIVISION HEAD

10:45 BREAK

11:00 WASTE ACCEPTANCE CRITERIA SYSTEM
H.NOUGUIER
SPECIFICATIONS AND QUALITY CONTROL DIVISION HEAD

11:45 SITE SELECTION AND PUBLIC ACCEPTANCE
A.FAUSSAT
DEPUTY CHIEF OF ANDRA

US PRESENTATION

2:00 U.S. DEPARTMENT OF ENERGY RADIOACTIVE WASTE MANAGEMENT
J.E. DIECKHONER

2:15 OVERVIEW OF THE LOW-LEVEL WASTE FACILITY SITING PROCESS
L.J. MEZGA

2:30 DOE SOLID LLW DISPOSAL FACILITY SITE SELECTION : THE PROCESS AND ORNL EXPERIENCE
S.D. VAN HOESEN

2:45 SAVANNAH RIVER PLANT LLW DISPOSAL FACILITY SITE SELECTION
B.D. HELTON

3:00 A SYSTEMATIC APPROACH TO GEOLOGIC AND HYDROGEOLOGIC SITE CHARACTERIZATION
R.H. KETELLE

3:15 SITE CHARACTERIZATION FOR THE SALSTONE DISPOSAL FACILITY
J.R. COOK

.../...

3:30 SITE CHARACTERIZATION INVESTIGATIONS AT OAK RIDGE NATIONAL LABORATORY
R.H. KETELLE

3:45 BREAK

4:00 RECENT ORNL EXPERIENCE IN SITE PERFORMANCE PREDICTION : THE GAS CENTRIFUGE ENRICHMENT PLANT AND THE OAK RIDGE CENTRAL WASTE DISPOSAL FACILITY
F.G. PIN

4:15 SITING OF A NEW LLW DISPOSAL FACILITY IN OAK RIDGE : PUBLIC INTERACTION AND INTERFACE
S.D. VAN HOESEN

4:30 ENVIRONMENTAL REVIEW PROCESS : SAVANNAH RIVER EXPERIENCE
B.D. HELTON

4:45 GENERAL DISCUSSION, ALL

5;15 AJOURN

Appendix IV

ANDRA Presentations

CEA/DOE WORKSHOP LLW SITING
AND CHARACTERIZATION

PARIS-OCTOBER 1-3, 1985

PROGRESS MADE IN SELECTION AND CARACTERIZATION OF NEW LLW DISPOSAL SITES

R.ANDRE-JEHAN

SITE SELECTION CRITERIA

The technical criteria that apply to site selection for a low-level waste repository in France may be grouped into two main catégories : seismic and hydrogeological, with geographical considerations also taken into accound.

Geological zones must have a history of seismic activity smaller than VI MSK.

The hydrogeological model used in France for purposes of site selection corresponds to the simplest and most prevalent surface geology, with easily predictable hydrogeological characteristics. The model consit of :

- a surface layer of clayey sand,
- a sub-surface layer of hard clay,
- a gentle slope with single direction for the sub-surface layer,

Water flowing out of the exutories must be collected by one or two small rivers below the site.

Another hydrographical criteria which has relation with topography, is to choose a site not to be flooded.

The geographical considerations, which are no absolute site selection criteria, are the surface area of the potential site, its topographic slopes and its accessibility by road or by rail.

SITE SELECTION METHODS

Based on the criteria described above, the methodology employed in the site selecti process in France goes from the general to the specific, and corresponds to a site procedure in which french governmental authorities intervene at pre-determined stages to formally review and approve recommandations made by ANDRA.
These stages are :

- Inventory of potential sites
- Investigation of some potential sites
- Testing and evaluation of final sites

The inventory of potential sites involves searching through geological records for sites that meet the seismic and hydrogeological criteria and that present favorable geographical conditions.

... / ...

It' s carried out by ANDRA in association with the BRGM or Bureau de Recherches Géologiques et Minières.

The investigation of potential sites consists of preliminary geological mapping, including drilling (both deep and core) and geophysical investigations.

For the testing and evaluation of final sites, ANDRA proceeds to characterise the site through intensive testing and evaluation activities. These activities are aimed at a more through knowledge of site specific characteristics, whether they be geological, seismic, hydrological, hydrochemical or radiological.

SELECTION CRITERIA

FOR LOW LEVEL RADIOACTIVE WASTE DISPOSAL SITES

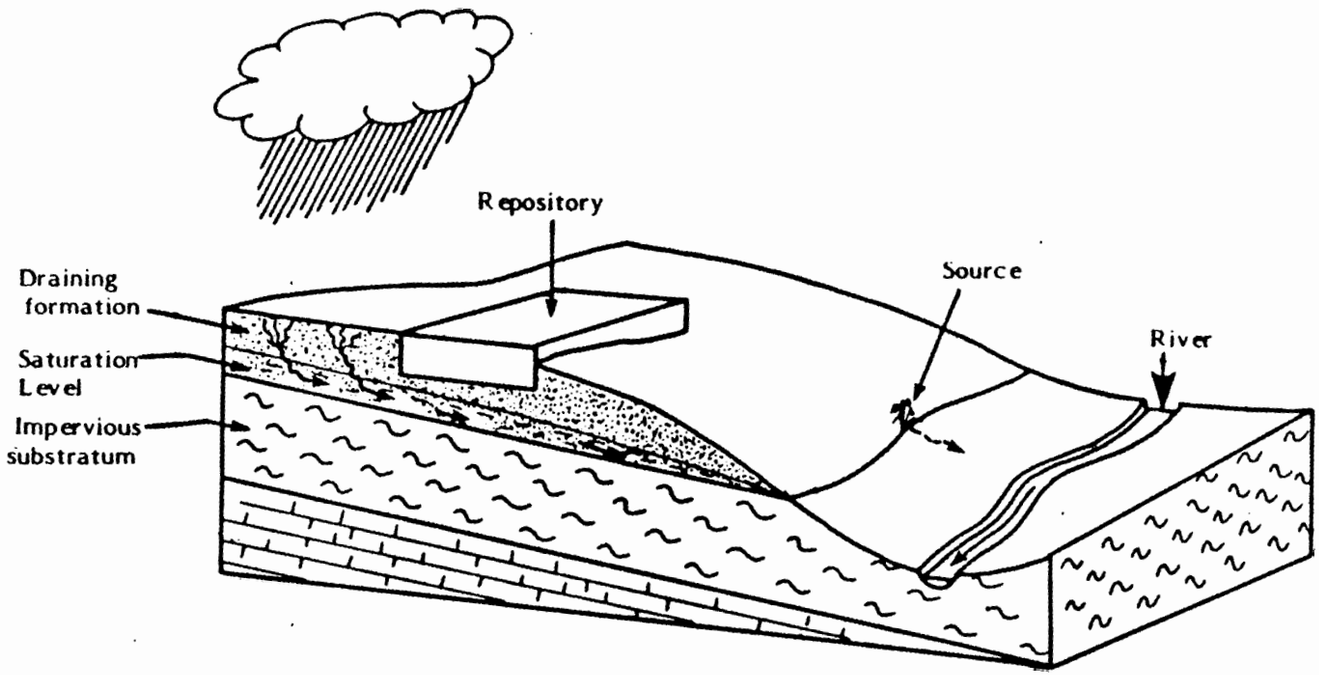
- LOW SISMICITY
  GUARANTEED GEOTECHNICAL STABILITY

- SIMPLE AND MODELIZABLE HYDROGEOLOGY
- WELL KNOWN EXUTORIES
- OUT OF THE MAXIMUM LEVEL OF THE GROUND WATER
- IMPOSSIBLE TO FLOOD

- GOOD RETENTION QUALITY

- ABSENCE OF NATURAL RESSOURCES OF ECONOMIC INTEREST

RFS 1984


Repository
Draining formation
Saturation Level
Impervious substratum
Source
River

SITE SELECTION METHODS

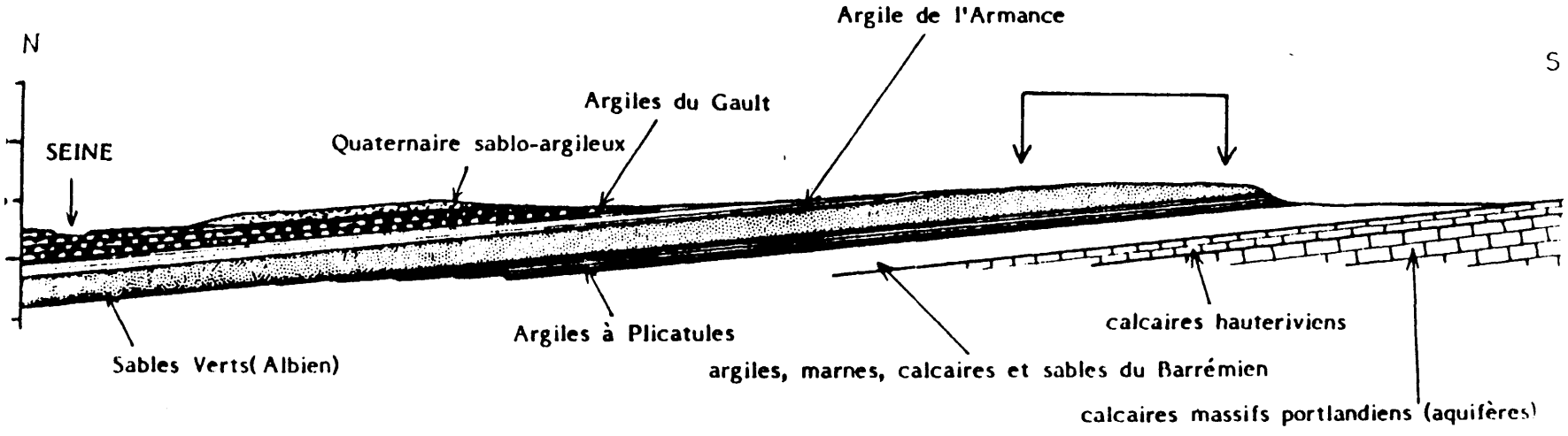
FIRST STAGE – INVENTORY OF POTENTIAL SITES
→ CLASSIFICATION

SECOND STAGE – INVESTIGATION OF POTENTIAL SITES
→ SELECTION

THIRD STAGE – QUALIFICATION OF FINAL SITE
→ VALIDATION

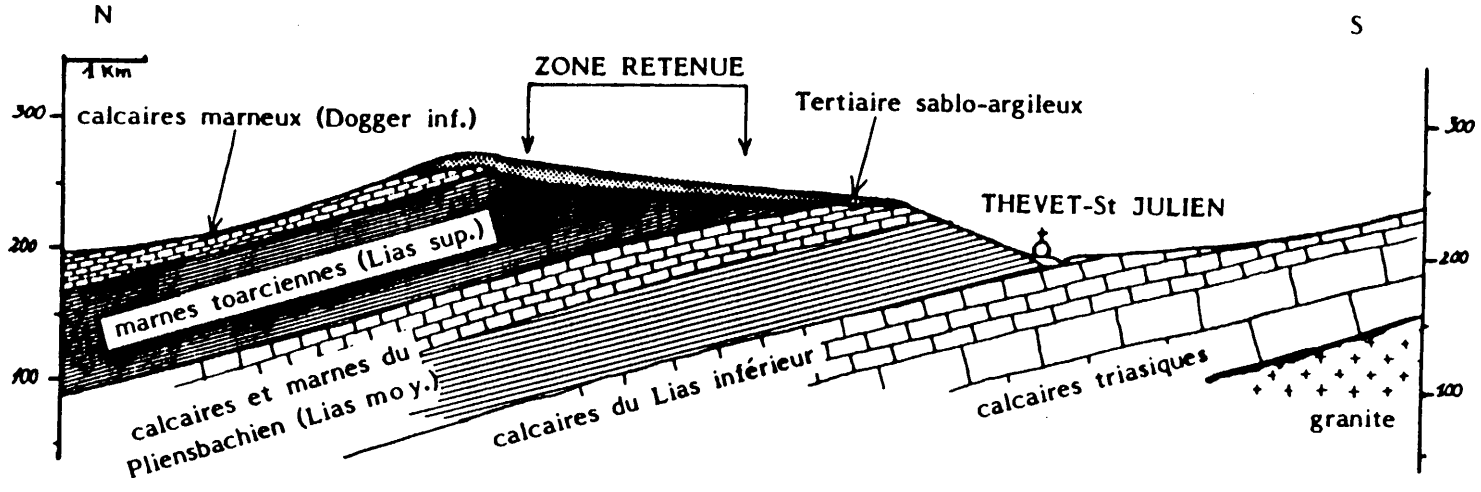
DEPARTEMENT : AUBE

Coupe géologique schématique



DEPARTEMENT : INDRE

Coupe de THEVET-St JULIEN



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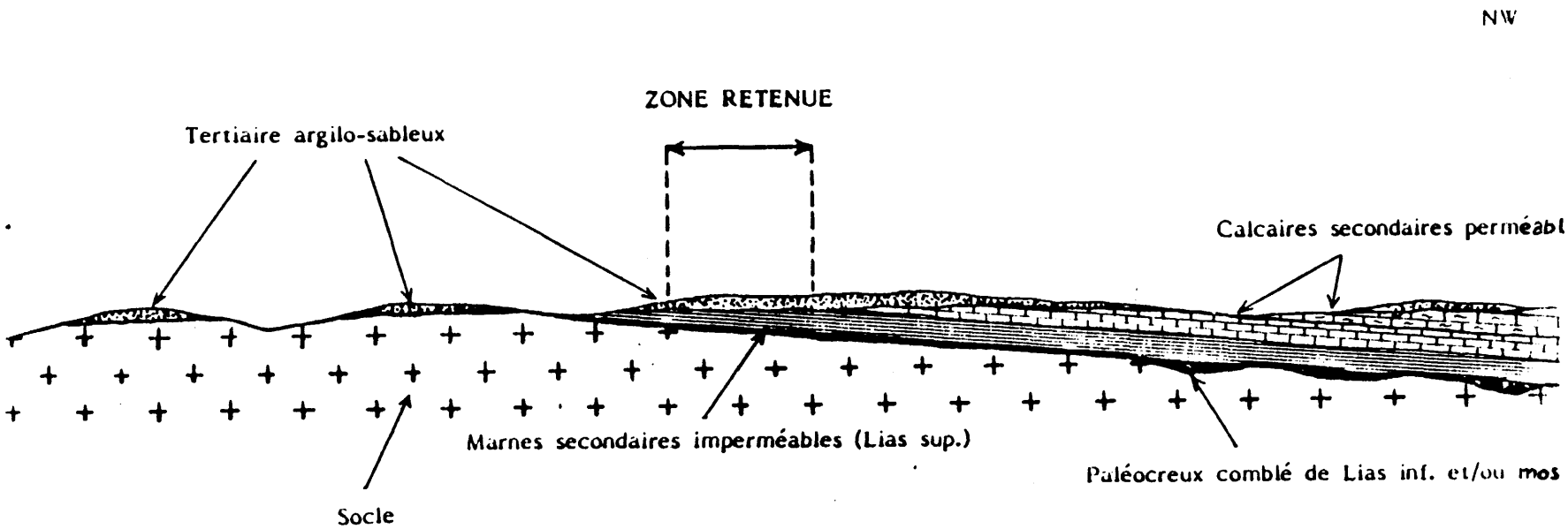
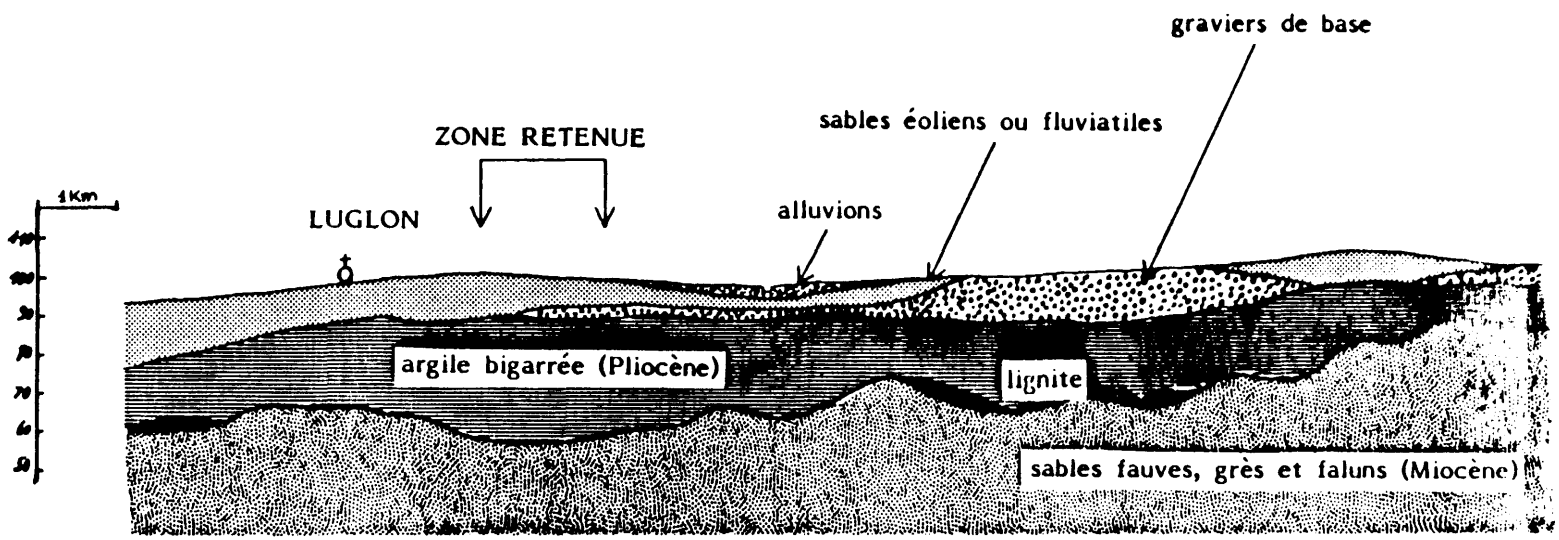


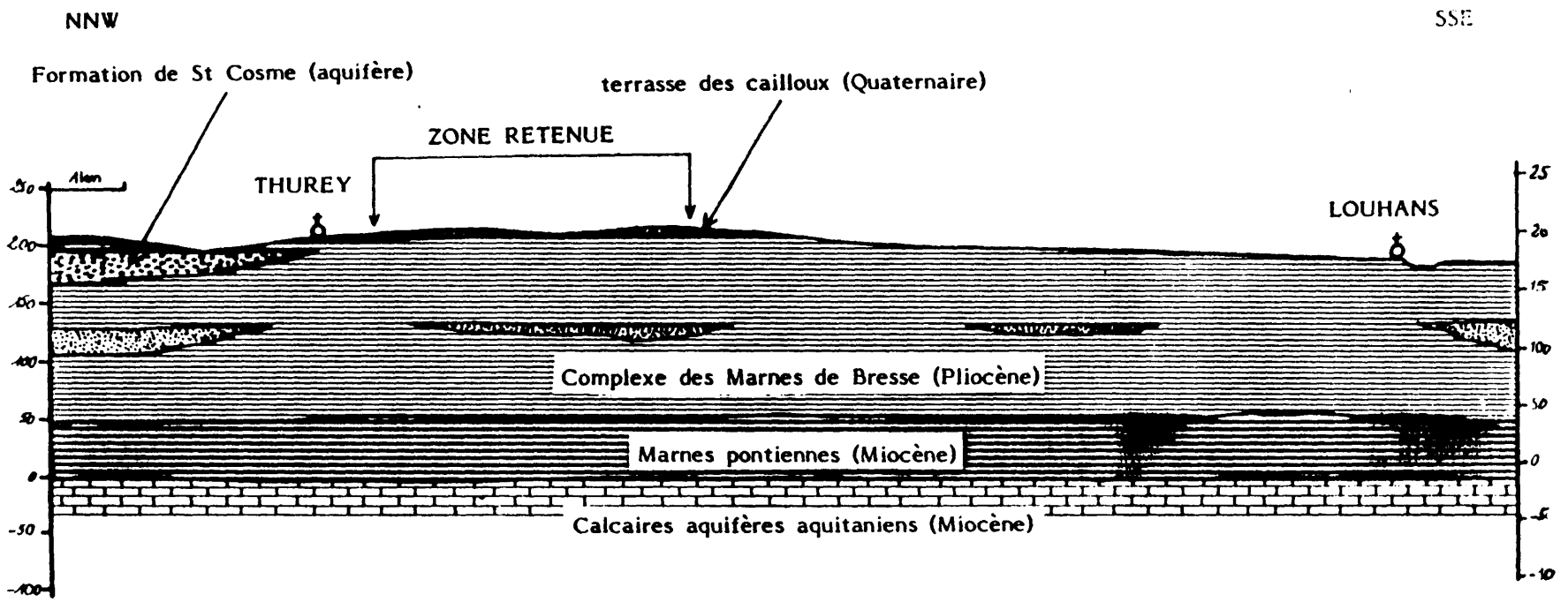
DEPARTEMENT : LANDES

W Coupe géologique schématique des Hautes Landes E



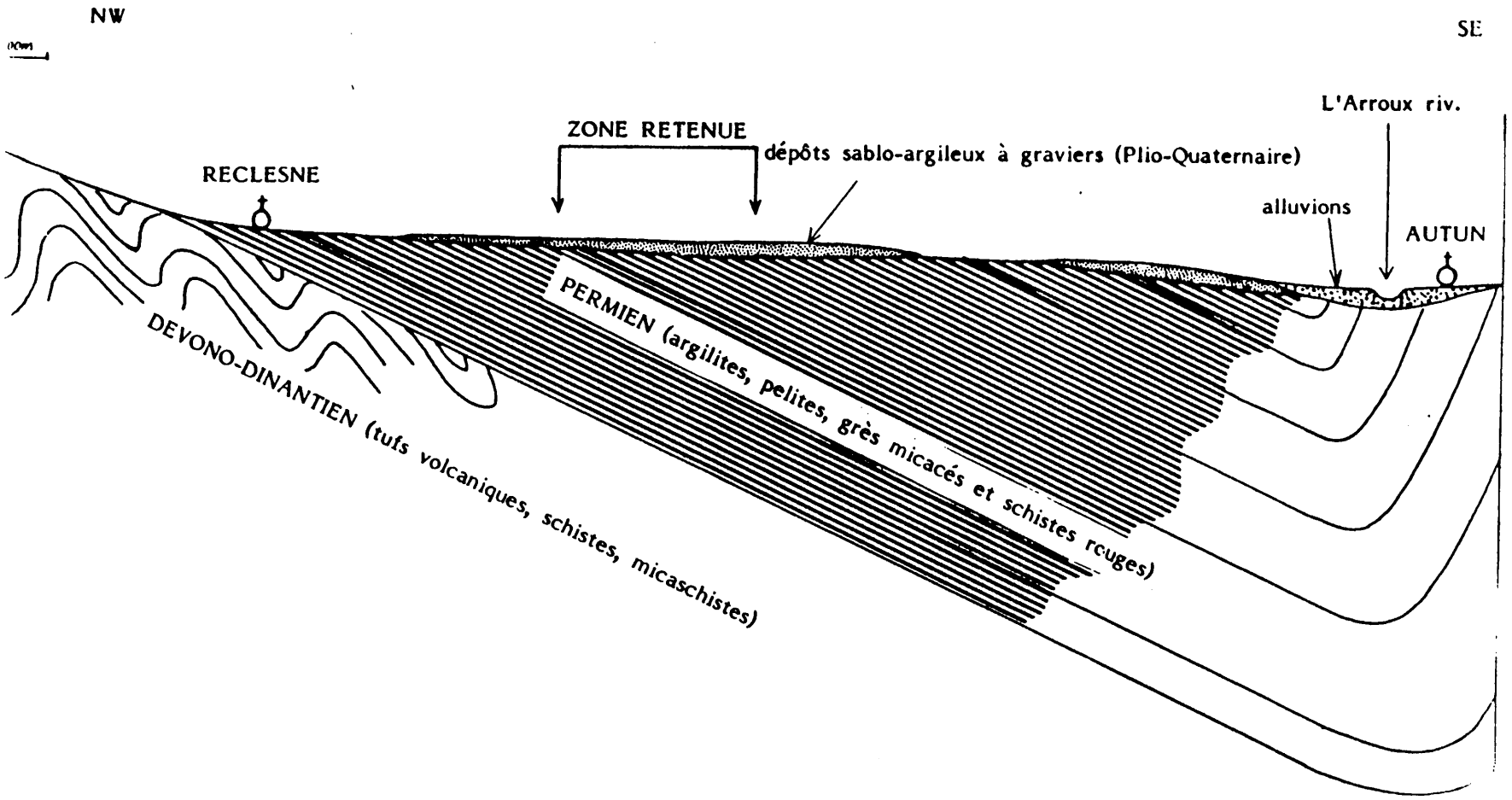
DEPARTEMENT : SAONE-et-LOIRE

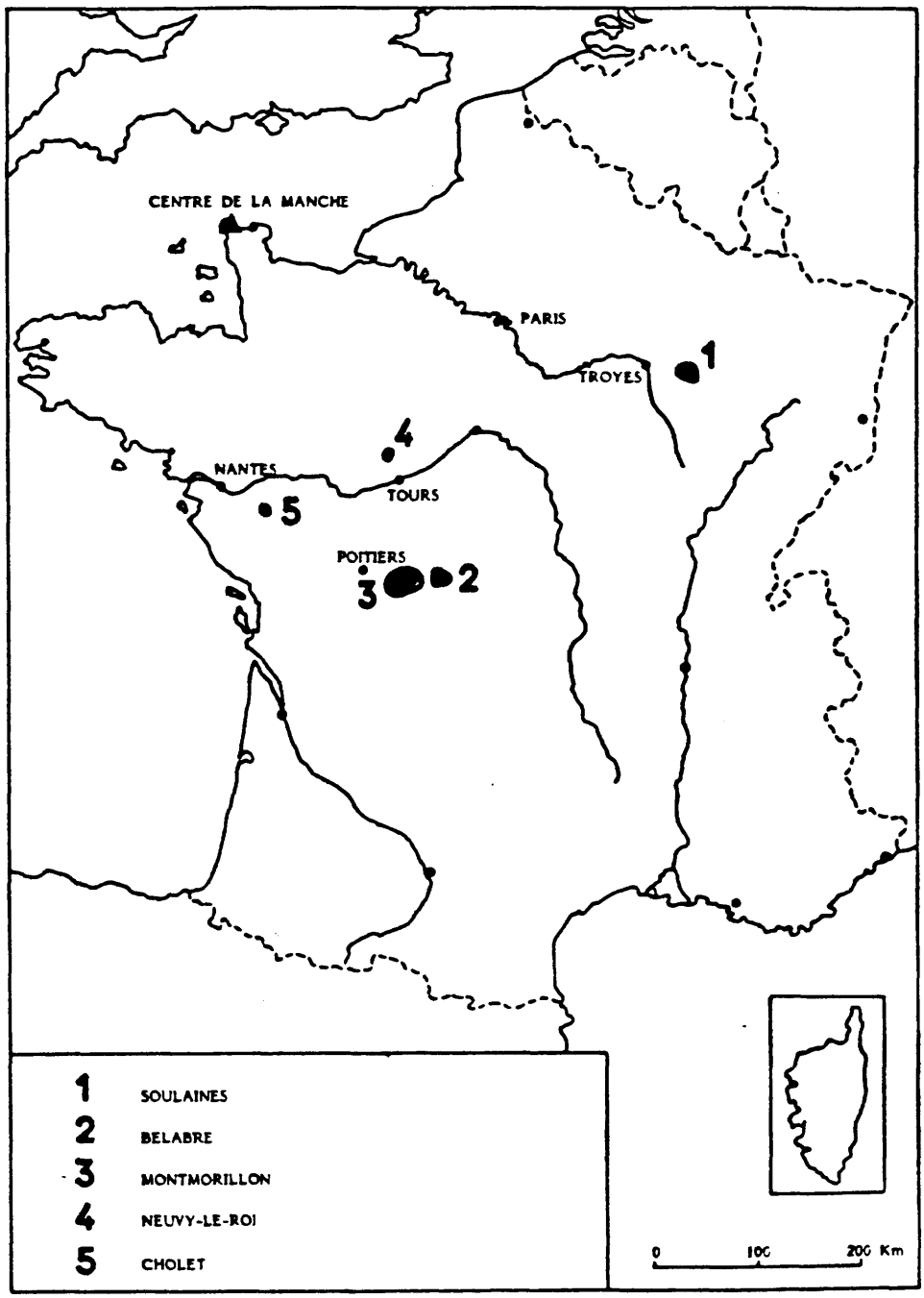
Coupe THUREY-LOUHANS



DEPARTEMENT : SAONE-et-LOIRE

Coupe de Reclesne-Autun




CENTRE DE LA MANCHE
PARIS
TROYES
1
4
NANTES
TOURS
5
POITIERS
3
2
1 SOULAINES
2 BELABRE
3 MONTMORILLON
4 NEUVY-LE-ROI
5 CHOLET
0
100
200 Km

40 Km² 10/1984 to 9/1985

KNOWLEDGE TO ACQUIRE	MEANS	ACCOMPLISHED WORKS IN AUBE
• Interface superficial formation – substratum	géophysics	28 kms of electric geophysical lines 51 electrical tests
• Existence of fractured zones. • Lithology and mapping of the superficial formation.	géological study and description of core samples	142 auger drilling 35 km² of geological map at 1/25.000 40 micropaleontologic determinations
• Natural reference state (exutories).	hydrology, météorology	5 gauging station + 1 météorologic station
• knowledge of the deep layers.	deep core drilling	2 deep core drilling 5 deep exploration bore-hole
• Average piezometric level.	piezometric bores	45 piezometric bores
• Hydrogeological characteristics of the superficial formations and substratum.	pumping test	60 pumping tests
• First data on the in situ run off directions.	Flow test with tracers	
• Geotechnical and radiological characteristics of the superficial ground	Laboratory testings on core drill	about 80 tests
• General topography of the site	topographic campaign	about 125 new topographic points

SITE QUALIFICATION OBJECTIVES

- PRECISE MODELLING OF THE UNDERGROUND FLOWS.
- INITIAL PHYSICAL, CHEMICAL AND RADIOLOGICAL STATE.
- EQUIPMENT AND DISPOSITION DATA.
- PRÉPARATION OF THE ENVIRONMENTAL IMPACT REPORT.
- ALL DATA REQUIRED FOR THE PRELIMINARY SAFETY REPORT.

CEA/DOE WORKSHOP ON LLW SITING
AND CHARACTERIZATION

PARIS-OCTOBER 1-3, 1985

WASTE ACCEPTANCE CRITERIA SYSTEM

H. NOUGUIER

The main purpose of waste management is to assure, during all the necessary time and in every foreseeable circumstance, the protection of the individuals and of the public as a whole against radiological hazards, which would not be acceptable.

The whole of the operations concerned by this management constitutes an integrated system participating in the realization of the purpose so defined. It is going to be described in the present report.

The principles of specifications drafting and procedures and packages agreement, as well as Quality Assurance organization and controls carried out in the waste producers facilities and on the disposal site, will be treated.

QUALITY ASSURANCE
APPLIED TO PRODUCTION, TREATMENT, PACKAGING AND DISPOSAL OF RADIOACTIVE WASTE

F.T. 82/13

1. GENERAL

1.2. Waste management purpose and safety principles

The main purpose of waste management is to assure, during all the necessary time and in every foreseeable circumstance, the protection of the individuals and of the public as a whole against radiological hazards, which would not be acceptable.

The whole of the operations concerned by this management constitutes an integrated system participating in the realization of the purpose so defined. These operations divide themselves into two complementary parts, which are currently designated as :

- upstream management, which covers routine operations of nuclear engineering generally carried out in the plants of the waste producers, and sometimes in final disposal facilities:

    - sorting of the wastes produced into various categories, in order to facilitate the ulterior operations of recycling, treatment and disposal,

    - eventual treatment of the wastes,

    - embedding and packaging of the solid wastes, which can be handled, transported, stored temporarily and disposed of in a safe and economical way,

    - transport assumed by ANDRA (Radioactive Waste Management Agency).

- downstream management, which applies to final disposal but also to temporary storage (said "interim storage") of wastes waiting to be removed into a final disposal facility.

1.3. Application field

Since, in the present state of technique, the complexity of the finished product does not always permit to realize an industrial control "a posteriori" of all the parameters intervening in the definition of the quality, the system used by ANDRA rests on the principle of the controls "a priori" of all the key- components of the "Waste production - Packaging - Storage" line. They apply to :

a) knowing of raw wastes,

b) specifications defined for containers and embedding materials (embedding, filling...),

c) methods used to realize the fixing matrices and packagings,

d) criteria selected for designing of the constructions and rules applied to their realization,

e) management operations of the centers.

2. PRINCIPLES AND GENERAL DESCRIPTION OF QUALITY ORGANIZATION

2.1. General principles

a) The safety fundamental principle for waste disposal being to isolate the radioactive materials from the environment until their activity has decreased enough to show no more potential hazards dangerous for man, ANDRA provides a system permitting to make sure that :

- design, realization and management of disposalfacilities permit to comply with the safety criteria and to optimize the waste management cycle,

- design and fabrication of the packages to be disposed of in the facilities agree with corresponding studies, approvals and specifications,

b) This system of quality organization relies upon Assurance Quality procedures including especially :

- organization measures,

- planified and systematic actions based on written and classified procedures,

- an assembly of precise rules applying to the various steps of definition and realization as well as to the controls associated with these rules,

- a filing of all the calculation notes, implementation plans, studies reports, specifications, programs and test reports as well as the decisions relating to components which are important for safety,

and whose part will consist in particular in :

- watching over the quality of the studies concerning the design of facilities and packaging methods,

- making sure by means of audits that the organisms concerned work really according to the Assurance Quality rules,

- checking that, when the facilities are realized, they are done in a workmanlike manner

and also on technical operations of quality control allowing in particular to :

- make sure by means of Super Controls that the controls of the sub-contractors are valid,

- verify by means of controls carried out at random and unannounced that the procedures used meet the requirements of the corresponding procedure books and approvals, and that the products are in agreement with the specifications.

c) The practical means adopted refer to the following general principles :

- previous control of the know-how of the persons or firms being in charge of the studies, realizations, productions and controls,
- physical separation between the units being in charge of productions and those assuring control,
- systematization of two control steps :
  - control of the sub-contractor or producer,
  - supervision, control and super-control by ANDRA,
- drafting of detailed written documents, defining production and control conditions, before realizations and productions,
- codifying of checking, circulation and diffusion of documents,
- organization designed in such a way that at every stage no control of the regulations requirements can be avoided or omitted.

2.2. Application steps of the actions of the Quality system

2.2.1. Drafting of ANDRA specifications

The whole process of the actions contributing to the drafting of the specifications may be described as follows :

a) The safety authorities describe the safety objectives of waste management and the safety fundamental rules, with which the various steps of that management must comply.

b) On these bases, ANDRA proposes technical safety alternatives for each potential disposal facility; these technical alternatives describe the main principles which will govern the technical realizations that are envisaged.

c) Once these technical alternatives have been adopted by the safety authorities, ANDRA establish safety reports relating to construction, then management, upon which the safety authorities give their agreement.

d) That agreement is accompanied by requirements that ANDRA, according to its creation act, converts into "specifications for packaging and storage of radioactive waste before disposal into long-term storage centers".

2.2.2. Agreement of procedures by ANDRA

Since ANDRA specifications delimite the permitted limits, the producers are quite free to study - or have studies made for - a method of waste packaging permitting to comply with the requirements of these specifications.

Only waste packages whose realization has been approved are accepted for disposal by ANDRA, regardless the fact that the packages are isolated units or elaborated in industrial series.

Accordind to these specifications, the waste producers submit to ANDRA agreement, for each type of package, a file including, in addition to the precise characteristics of contained waste, the procedure book of fabrication of these packages and the results of the qualification tests (caracterization).

This file is established from caracterization tests realized within conditions approved by ANDRA.

This agreement request is confronted with ANDRA specifications.

- Actually, the very long time required for the qualification tests imposes to pass through a temporary agreement granted on the basis of studies of procedure in non-active form, of provisional procedure books, of partial results in active form.

- The temporary agreement can then be delivered. It may concern a limited quantity or a limited realization delay. Derogations of the specifications may eventually be granted one by one.

- The following step, leading to the final agreement file, is over when all information complements are given or when complementary studies have been completed, and when the procedure and the package have been qualified.

- At this stage, the whole of the specifications must be respected.

2.2.3. ANDRA control procedures

These procedures rest upon :

- procedures books or fabrications series,

- "operator" or "producer" control results,

- ANDRA specifications.

The controls will concern :

a) conformity of the procedure to ANDRA agreement,
conformity of production to procedures,
materials used for construction,
follow up of the parameters having an incidence on the quality.

b) for the product :
conformity to specifications,
accessible control points.

They are certified by the drafting of control cards by ANDRA.

2.2.4. Product quality (Annexe 1)

The quality of the product (package reaching the disposal stage) is insured in two successive steps :

- follow up of quality and intervention of package controls from previous studies, definition of procedure, ANDRA agreement, production, delivery and treatment of "cases non consistent with the specifications".

A particular attention is paid to the knowing of raw wastes by a control of the fissile material content and a determination of the radionuclides spectrum.

- ANDRA control actions when the wastes are received on the disposal centers. At this stage, the purpose of the action of ANDRA super control is a better knowing of the wastes, detection of anomalies and an improvement of the procedures and specifications by a complement of information on studies (through quality filer).

Note : The wastes packaged on an ANDRA center are submitted to the same quality requirements and to the same procedures and controls that those packaged in a producer's plant.

2.2.5. Quality of constructions (Annexe 2)

Through Quality Assurance and controls (carried out by ANDRA inspectors or by specialized organisms - CEBTP, VERITAS...), ANDRA makes sure that the whole of the sub-contracted work is realized according to quality organization rules, thus allowing to guarantee that constructions :

- meet the requirements of the options taken by ANDRA,
- meet the requirements of specifications,
- have been realized in a workmanlike manner.

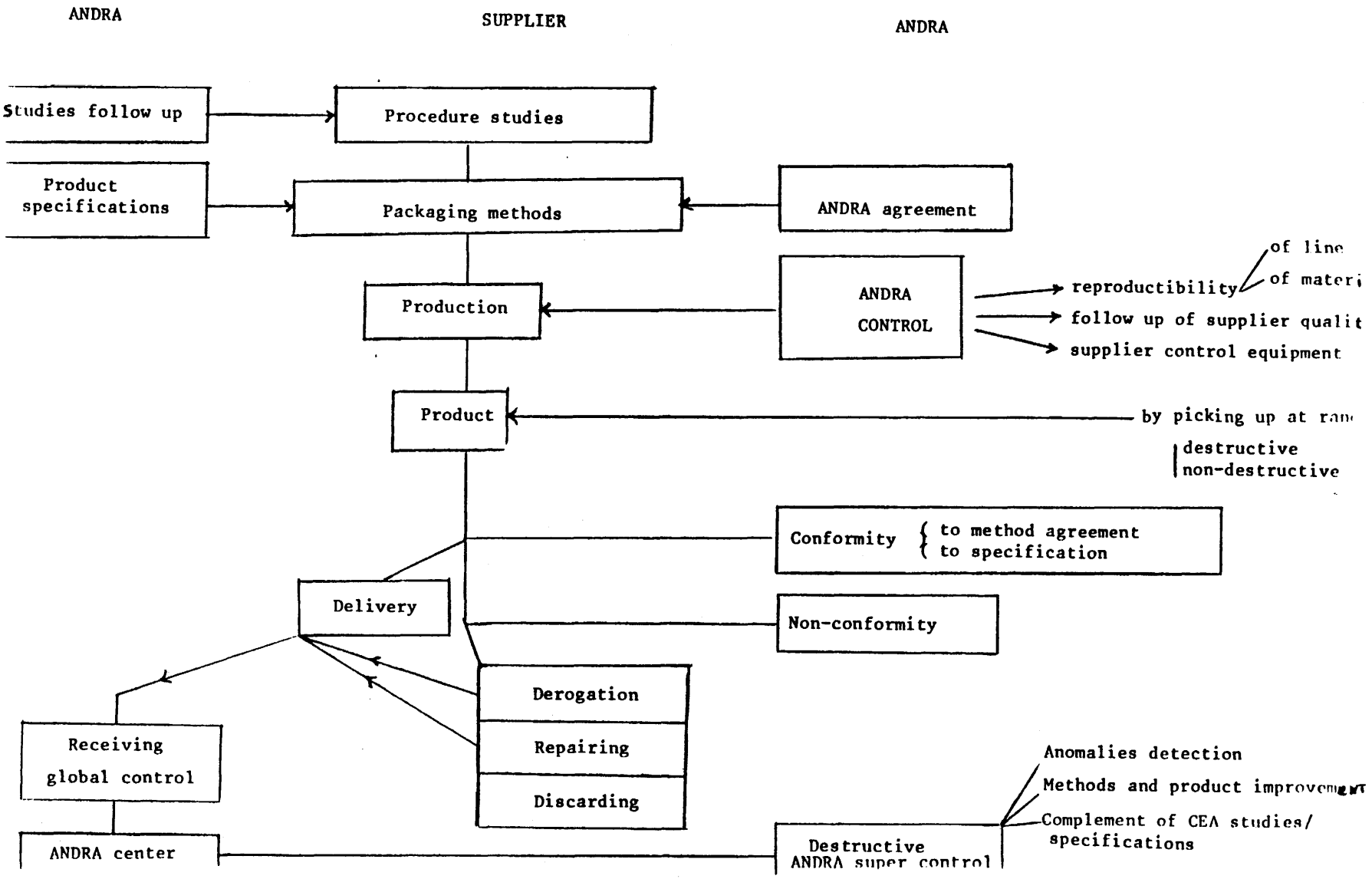
2.2.6. Quality of stored product

It will be guaranteed by :

- control upon arrival on site that the packages are delivered in accordance with the indications given on the shipping lists, that the packages are compatible with the requirements concerning the disposal center.

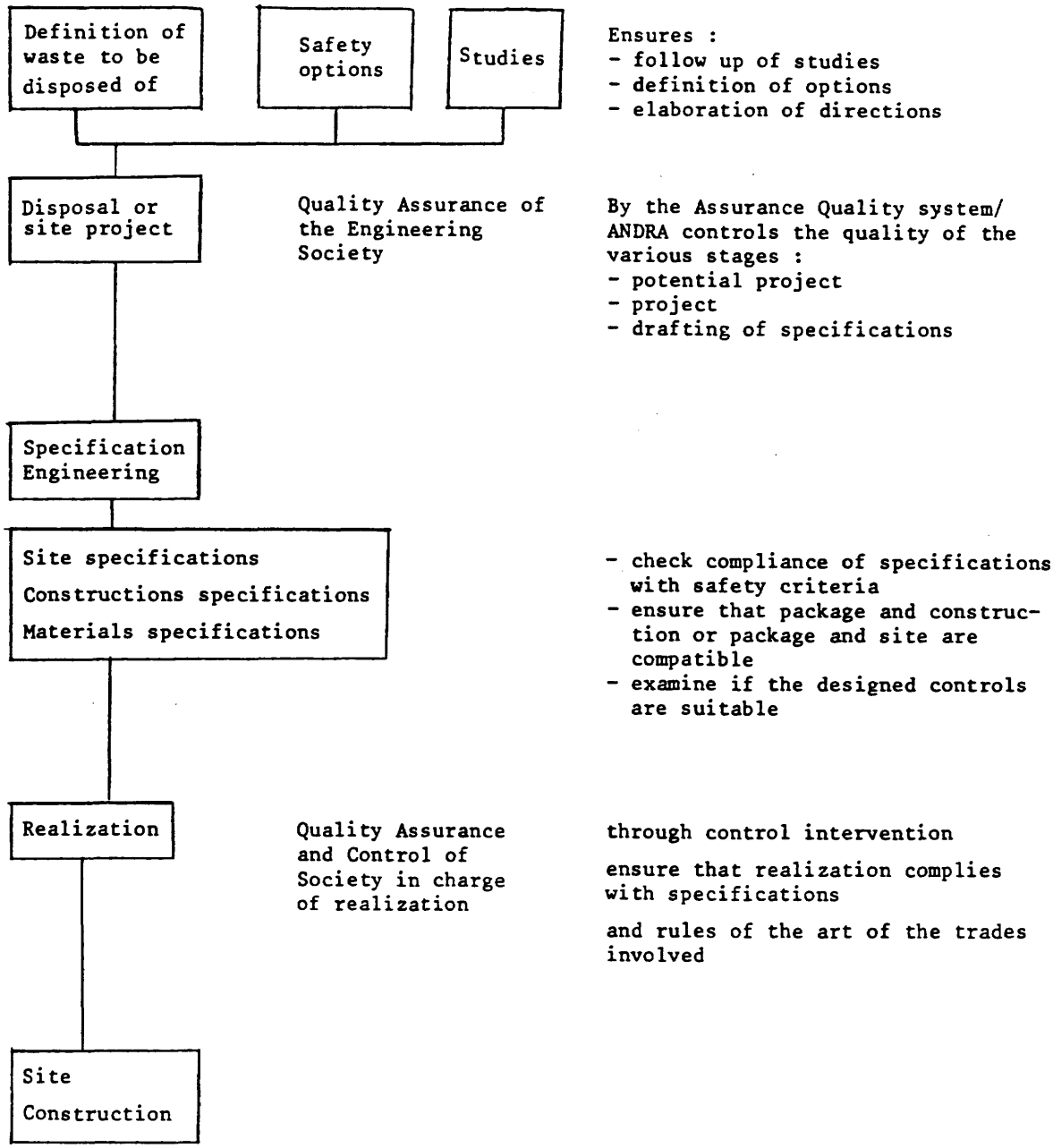
  The data inscribed on these shipping lists engage the responsibility of the producer.

QUALITY OF SUPPLIER PRODUCT



DISPOSAL QUALITY

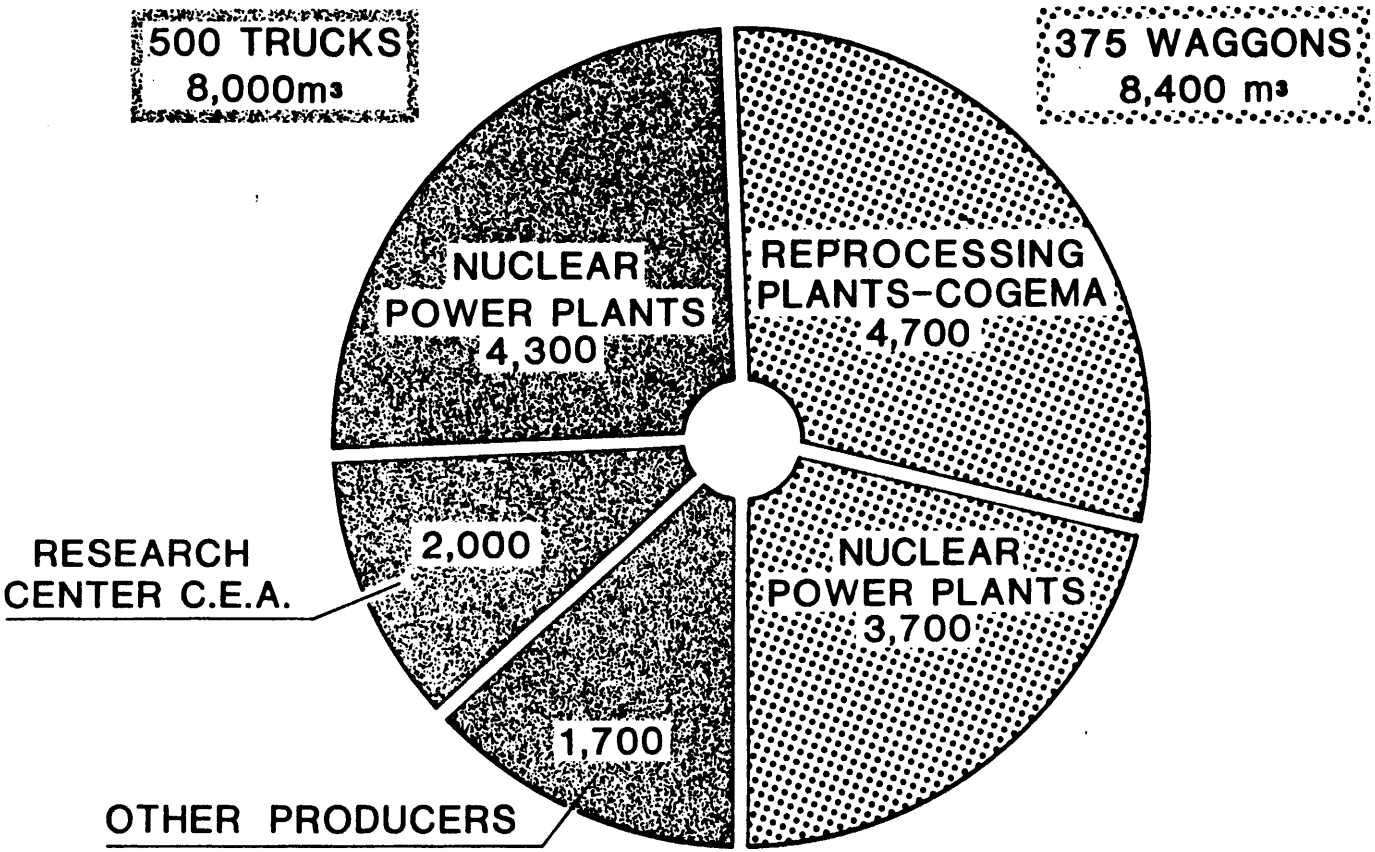
ANDRA



ANNEXE 2

MISCELLANEOUS

ROAD & TRAIN TRANSPORT ACCORDING TO VOLUMES



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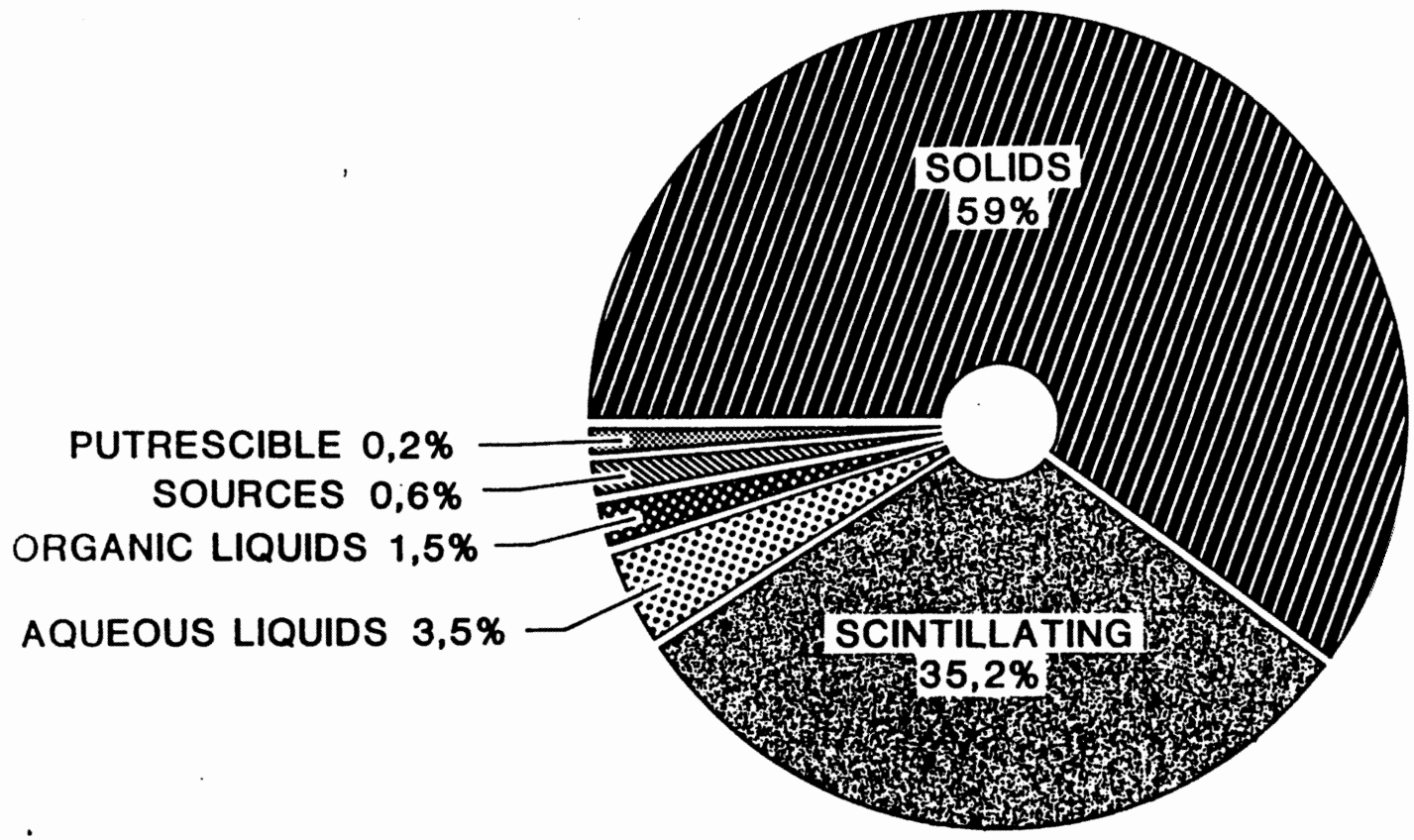
WASTE DISTRIBUTION ACCORDING TO CATEGORIES



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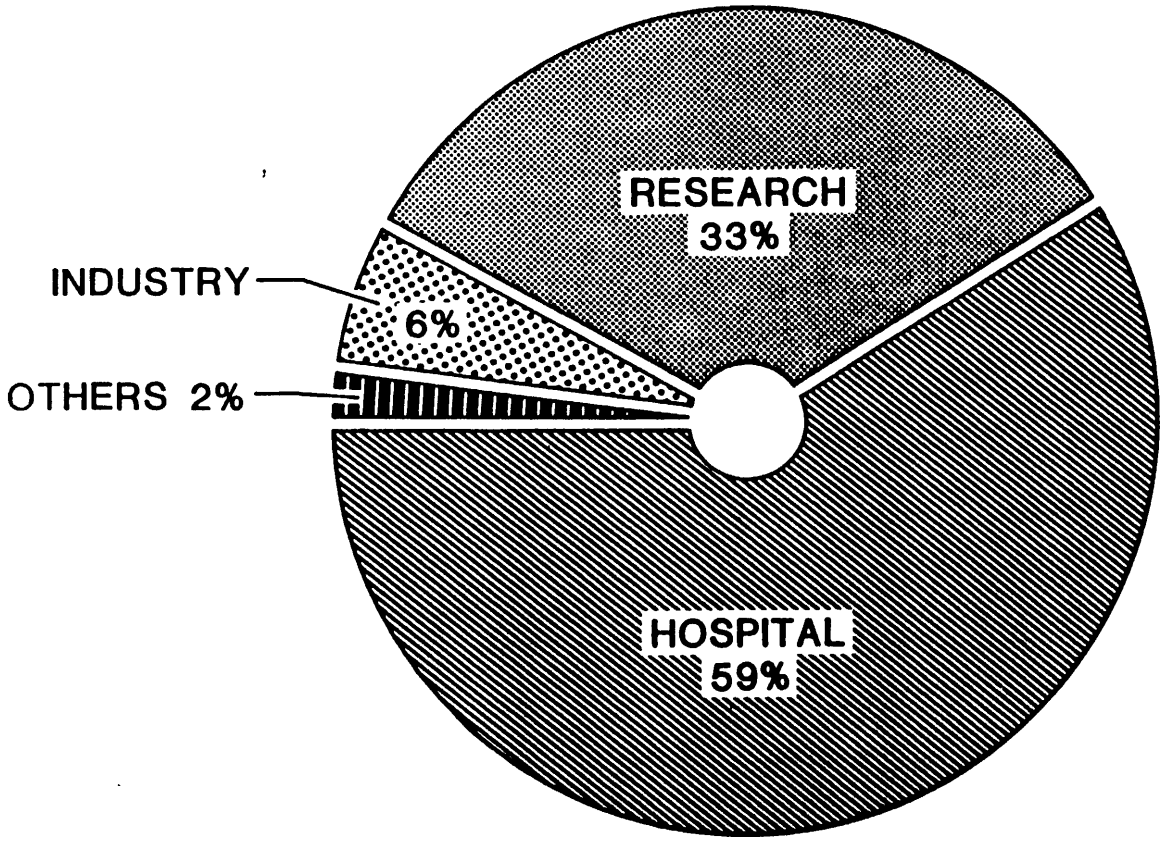
WASTES DISTRIBUTION ACCORDING TO VOLUMES



ANDRA

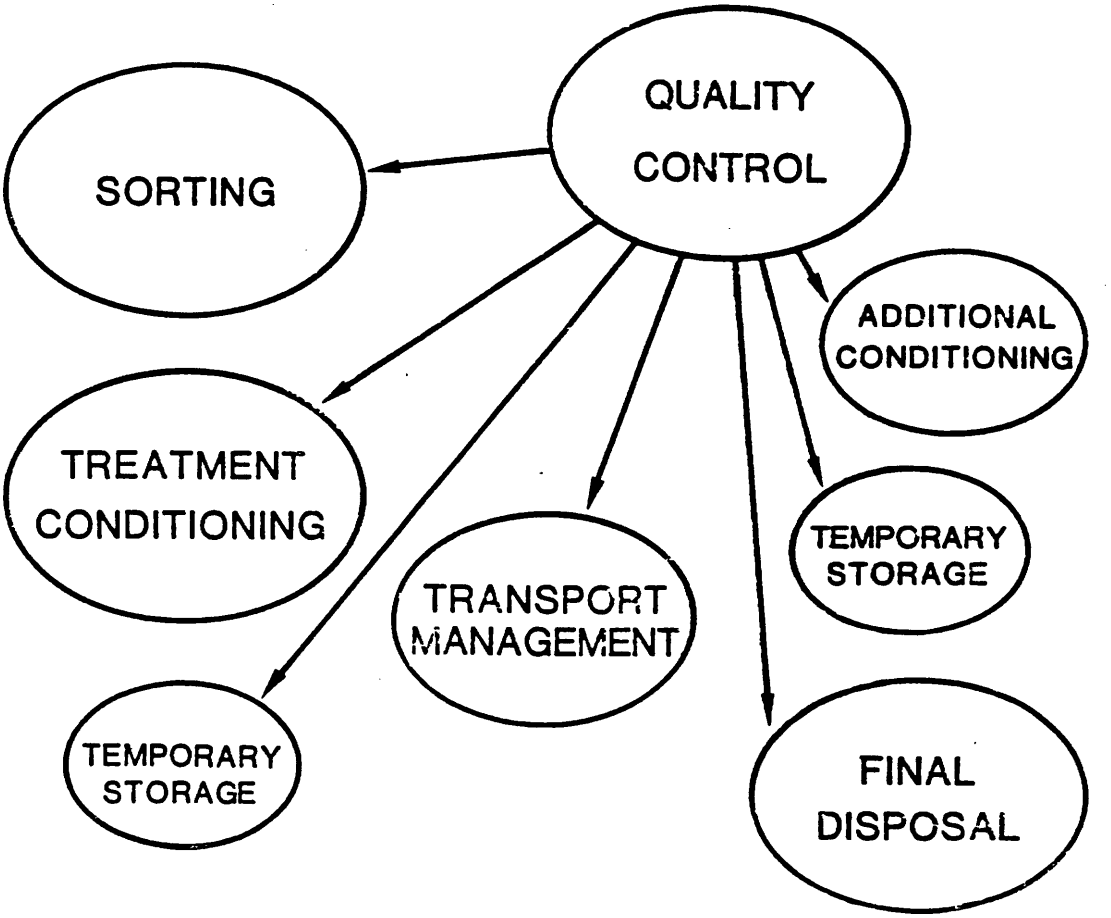
ANDRA

NATIONAL WASTE MANAGEMENT AGENCY

ALL CATEGORIES OF WASTE
(LLW. MLW. TRU. HLW.)

ALL PRODUCERS

PRODUCERS **ANDRA**



NUCLIDE	WASTE NON EMBEDDED	WASTE EMBEDDED
^{3}H	7.4 (0.2)	$7.4\ 10^{1}$ (2)
^{60}Co	3.7 (0.1)	$4.8\ 10^{4}$ (1,300)
^{90}Sr	3.7 (0.1)	$7.4\ 10^{2}$ (20)
^{137}Cs	3.7 (0.1)	$4.8\ 10^{3}$ (130)
	MBq/kg Ci/t	

QUALITY ASSURANCE 1985

AUDITS	EDF	13
	COGEMA	3
	CEA	11
	FUEL CYCLE	6
	ANDRA CONTRACTORS	5
CONTROLS	WASTE PRODUCERS	45
	CENTRE MANCHE	20

	Plants	Volume m3	Nb Packages	Type of Package
ARMY	1	1 400	3 000	
COGEMA	3	3 000	13 000	17
EDF	14	18 500	49 000	24
CEA	6	2 000	7 000	34
FUEL CYCLE	6	1 600	7 600	25
SMALL PRODUCERS	250	1 500		

01.01.85

Appendix V

SGN-Prepared Discussion Points

SGN

October 3, 1985

DISCUSSION POINTS I

WASTE FORM

1. Safety considerations (objectives)

2. Waste acceptance criteria

3. Waste form qualification
   - qualification procedures
   - tests performed (list)
   - process qualification (reproductibility)
   - QA/QC and inspection

4. Processing at the disposal site

5. Waste form/disposal method considerations

SIGN

October 3, 1985

DISCUSSION POINTS II

DISPOSAL DESIGN FOR OAK RIDGE

1. Safety considerations (objectives)

2. Site conditions

3. Disposal structures
   - water collection networks
   - concrete pads
   - monoliths, tumuli, canyons
   - disposal cap

4. Auxillary structures
   - compaction unit
   - incineration unit
   - cementation unit
   - water treatment station

5. Recordkeeping system

6. Preliminary safety analysis report (TBD)

Appendix VI

CEA/SGN -- DOE Implementing Agreement

STATEMENT OF INTENT

between

THE UNITED STATES DEPARTMENT OF ENERGY

and

THE FRENCH COMMISSARIAT A L'ENERGIE ATOMIQUE

on

THE WEST VALLEY DEMONSTRATION PROJECT

WHEREAS

The UNITED STATES DEPARTMENT OF ENERGY (DOE) and the FRENCH COMMISSARIAT A L'ENERGIE ATOMIQUE (CEA) have entered into an Agreement in the field of Radioactive Waste Management on July 26, 1983;

Article 2 of the DOE/CEA Waste Management Agreement provides for the possibility of cooperation in the areas of preparation and packaging of radioactive waste and of decontamination and decommissioning;

Article 4 of the DOE/CEA Waste Management Agreement provides for Implementing Agreements which may involve the associated firms or laboratories of DOE and CEA or their contractors or subsidiaries;

DOE has an interest in the treatment of high level radioactive waste and in decontamination and decommissioning activities at the Western New York Nuclear Service Center located at West Valley, New York; and

CEA, together with its associated firm SOCIETE GENERALE POUR LES TECHNIQUES NOUVELLES (SGN), possesses a unique capability to provide certain engineering and technical support services in the areas of radioactive waste handling and treatment, and decontamination and decommissioning.

NOW THEREFORE

DOE and CEA hereby confirm their intent to cooperate in the areas of treatment of radioactive waste and decontamination and decommissioning activities throughout the course of the DOE Demonstration Project at the Western New York Nuclear Service Center located at West Valley, New York.

The terms and conditions defining the cooperation shall be set forth in a contract or contracts to be negotiated between DOE or its contractors and SGN. Such contract or contracts shall in particular include terms and conditions governing patent rights and the exchange of information between DOE and its contractors, on the one side, and CEA and its associated firm SGN on the other.

It is the intent of DOE and CEA that CEA shall provide to DOE the information controlled or developed by CEA which is required by SGN to perform the engineering services within the task areas described in the contract or contracts, and that DOE shall provide to CEA the results of the work to be performed at West Valley under the contract or contracts, within the task areas described in the contract or contracts.

Based on preliminary discussions among CEA, SGN, DOE, and DOE contractors, it is expected that SGN may provide the following types of services under such contract or contracts:

1) Feasibility and Trade-off Studies
2) Preconceptual Design
3) Conceptual Design
4) Preliminary and Final Design Services
5) Review and Comment
6) Safety Analyses
7) Cost Estimating
8) Scheduling
9) Systems Integration
10) Bid Specifications
11) Supply and Delivery of Specific Equipment
12) Review of Construction
13) Assistance During System Installation, Checkout, and Radioactive Operation.

The specific services will be identified in such contract or contracts by mutual agreement for performance by SGN, provided the Project is otherwise proceeding, and subject to the availability of appropriated funds.

Planned task areas requiring the foregoing services are listed below:

1) Process Chemisty
2) Feed System
3) Process Control
4) Remotization/Maintenance
5) Off-gas System
6) Canister Welding System
7) Canister Decontamination System

Additional task areas may be added by mutual agreement.

Signed at Washington, DC, this 27th day of October 1983 in duplicate in the French and English languages, each equally authentic.

FOR THE UNITED STATES
DEPARTMENT OF ENERGY

Shelby T. Brewer

Assistant Secretary
for Nuclear Energy

FOR THE COMMISSARIAT
A L'ENERGIE ATOMIQUE OF FRANCE

Bertrand Barré

Nuclear Attaché
Embassy of France

SGN

PROPOSED WORK TASKS

FOR THE WEST VALLEY DEMONSTRATION PROJECT

ITEM	Safety Reviews	Check & Review	Conceptual Design (TITTLE I)	Basic Design (TITTLE II)	Detailed Design (TITTLE III)	Procurement (TITTLE II/III)	Equipment Installation (TITTLE III)	Start-up (Cold) (TITTLE III)	Start-up (Hot)
CTS Conceptual Design	X	X	Parts	Parts	Parts	Parts	P	P	A
Feed Preparation	X		X	X	X	X	S	S	A
Off-Gas Treatment & Acid Recovery	X		X	X	X	X	S	S	A
Canister Feed System	X		X	X	X	S	S	S	A
Canister Welding	X		X	X	X	X	S	S	A
Canister Decon	X		X	X	X	X	S	S	A
Canister Transfer	X		X	X	X	S	S	S	A
Remote Maintenance & Handling	X	X	X	X	X	S and Parts	S	S	A
Process Control & Data Systems	X		X	X	X	S	S	S	A
Glass Sampling			C/D	C/D	C/D		S	S	A

Legend : P = Participation
S = Supervision
A = Assistance
C/D = Common Development

SGN: 21/7/83

August 16, 1983

WEST VALLEY DEMONSTRATION PROJECT

S G N SCOPE OF WORK

TASK 1 - PROCESS CONTROL

Subtask 1 : Detailed Analysis of the computer system for the WVDP and Basic and Detailed Design of the computer system including detailed logic diagrams for operations and safety analysis.

Subtask 2 + 3 : Report on the adequacy of the system to control process/product reliability and Basic Design, Detailed Design of the instrumentation required for total process/product control, including instrumentation process data sheets, equipment lists, specifications and reliability targets, schedules, piping and cable routing diagrams ; automatic operations controls, sequences and interconnections diagrams ; equipment layout drawings ; and schematic loop diagrams.

TASK 2 - PROCESS CHEMISTRY

Subtask 1 : Basic and Detailed Design of the sampling system and analytical equipment including analytical techniques. This includes identification of key waste constituents to be monitored and establishment of the acceptable variation tolerances for these waste constituents.

Subtask 2 : From our experience gained in AVM operations and tests on surrogate West Valley wastes, Basic and Detailed Design of the chemical processes, including operating parameters definitions.

Subtask 3 - 4 : Establishment of cold test and start-up procedures based on Marcoule operations experience and cold tests on surrogate Waste Valley wastes.

TASK 3 - FEED SYSTEM

Basic Design and Detailed Design of the waste feed system and its equipment, including agitation of waste in the field tank and airlift transfer systems, declogging devices and others.

.../...

TASK 4 - REMOTIZATION/MAINTENANCE

Basic Design and Detailed Design of all remote maintenance systems, including procedures for dismantling operations.

TASK 5 - OFF-GAS SYSTEM

Subtask 1 : Check and review of WVNS off-gas system flow sheet. This subtask would include an evaluation of utilizing existing West Valley O114 facility and its off-gas system components in the design.

Subtask 2 - 5 : Basic Design and Detailed Design of off-gas system based on operating experience at Marcoule, with particular attention given to the effects of acidified waste fed to the melter on the performance of the system and to the effects of corrosion.

TASK 6 - CANISTER WELDING TECHNOLOGY

Basic Design and Detailed Design of a welding station including :

- the in-cell welding system with its remote equipment
- the canister handling system
- the power source for supplying the welder current
- the control system.

TASK 7 - CANISTER DECONTAMINATION STATION

Analysis of the different canister decontamination processes and Basic Design and Detailed Design of a canister decontamination station including :

- the in-cell decontamination equipment with its remote equipment
- the canister handling system
- the decontamination feeding system
- the control system.

TASK 8 - CANISTER FILLING SYSTEM

Basic Design and Detailed Design of the canister filling system.

TASK 9 - CANISTER TRANSFER

Basic Design and Detailed Design of the canister transfer system.

TASK 10 - PROCUREMENT, INSTALLATION AND START-UP

Technical assistance during the procurement, equipment installation and cold and hot start-up operations.

.../...

SIGN

3.

TASK 11 - CTS CONCEPTUAL DESIGN

Check and review and safety review of the conceptual design for the component test stand and participation in Basic Design and Detailed Design.

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