FOREIGN TRIP REPORT

RADIOACTIVE WASTE MANAGEMENT COMMITTEE MEETING

PARIS, FRANCE

JANUARY 24 - 25, 1989

Prepared by C. Cooley

February 6, 1989

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SUMMARY

Travelers: T. H. Isaacs, Associate Director, Office of External Relations and Policy (RW-40) and C. R. Cooley (RW-422). U.S. delegation included J. Mathur (DP-123), D. Fehringer (USNRC) and V. Oversby (LLNL)

Date of Travel: January 22 - January 27, 1989

Destination: Paris, France

Purpose: To participate in the Radioactive Waste Management Committee (RWMC) Meeting of OECD/NEA.

Cost: $1600/person for travel. $5000 estimated preparation cost.

Abstract: The RWMC endorsed continuing existing activities and the supporting groups within the constraints of the NEA budget. The U.S. delegation actions included: 1) recommending that the RWMC, at its next meeting in December 1989, review the general performance assessment activities as well as those activities related to waste package performance, 2) expressing concern that performance assessment activities remain focused on the methodology rather than the evaluation of particular scenarios, 3) recommending that NEA consider a future conference on waste generation and volume reduction (DP interest), 4) expressing technical support for the thermochemical data base (TDB) project, and 5) indicating an interest in future subseabed activities without a commitment to participate. The RWMC agreed to consider U.S. proposed topics at the next RWMC meeting. Japan's proposal to the NEA Fuel Cycle Committee (FCC) on transmutation was made available to the RWMC. Transmutation will be discussed at a special meeting in June where Japan will explain the proposed study. The proposed transmutation study will also be considered by the FCC at its June 1989 meeting.

Summary of Commitments and Actions

RWMC meeting

1. OCRWM will review its support for the Thermochemical Data Base(TDB) and advise the NEA of its budget allocation for U.S. sponsored review team members supporting the TDB.

2. OCRWM will continue participation in PAAG, PSAC, ISAG, Hydrocoin, INTRAVAL, the Stripa project, the GMD and the TDB project, and associated groups. OCRWM will advise NEA on the official U.S. participants/contacts for each group.

3. OCRWM will send RWMC members the official announcement for the Spring 1990 Las Vegas meeting.

Actions Resulting from Side Discussions

1. The Commission of European Communities (CEC) will send DOE a draft summary of the meeting of the Principal Coordinators (S. Orlowski, CEC and C. Cooley, USDOE). It will include a response by CEC to our invitation to be a co-sponsor in the April 1990 Las Vegas meeting.

2. NAGRA (SZ) and OCRWM will discuss possible future joint projects and will work towards resolution of the scope of work in time for a decision at a bilateral meeting in Washington D.C. scheduled in July 1989.

Recommended Followup Action Items

1. Request CEC document on cost of disposal.

2. Develop and implement plans to improve coordination with CEC.

3. Send letter to Olivier on waste package (near-field) performance assessment.

4. Send Olivier a letter on TDB describing OCRWM activities based on RW-20 and RW-30 input.

5. Provide NEA with background material on the U.S. recommended scope of the volume reduction meeting (DP)

6. Respond to Swiss request for better coordination of visitors including more advanced planning for the dates of the meeting.

7. Request copies of AECL's fact sheets on waste disposal.

8. Provide NEA with a comment letter in response to Olivier's inquiry on ways to improve the functions of NEA.

DETAILS OF RWMC MEETING

Director General Uematsu opened the meeting by stressing: a) preservation of technical credibility of NEA, b) improvement in public understanding of radioactive waste management, 3) cooperation with other directorates of mutual interest to RWMC, such as with the OECD Environment Directorate on matters of environmental protection, and 4) acknowledgment that periodic meetings of top level regulators should be held. Mr. Stadie, Deputy Director of Nuclear Safety, described the formation of a new committee on nuclear safety and technology to be responsible for an expanded role including that of the CSNI (Safety of Nuclear Installations) with emphasis on interactions with the ICRP (International Commission on Radiation Protection).

Delegation commented on the activities of the
nce Assessment Advisory Group (PAAG) as follows: 1) it
ed focus on methodology and approach for performance
ent studies particularly involving accident scenarios and
e specific selection of scenarios, 2) it expressed caution
ning the perception that validation can provide more
dence than is likely, and 3) it requested a review of the
activities at the next RWMC meeting with special
ideration of PAAG's role in waste package performance
essment in repository environments. The Canadian delegation
pressed concern about defining the quality assurance levels to
applied to computer codes and models.

he U.S. Delegation agreed to provide financial support to U.S.
review team members working on the first set of five elements,
(U, Pu, Am, Tc and Np) for the Thermochemical Data Base.

The RWMC actions were:

1. Recommended no changes in current programs but agreed to review the plans and future direction of the PAAG as well as its role concerning waste package performance during the next RWMC meeting as requested by the U.S. delegation.

2. Approved a technical review of the Dutch waste management program.

3. Agreed to proceed with completion of the first five elements in the TDB. Agreed to continue compiling data on Iodine since it was already started. (U.S. is not involved in the Iodine group.)

4. Sanctioned continued publication of the NEA Nuclear Waste Bulletin.

5. Extended the membership of the existing Bureau for another year -- (Paul Dejonghe, BE; W. Hancox, CA; R. Rometsch, SZ)

6. Noted the need to keep RWMC informed on the Fuel Cycle Committee review of costs, which will now include waste management costs, and on the developments concerning the FCC review of the Japanese proposed study of transmutation.

1 to consider planning a conference on waste generation lume reduction to be approved at the next RWMC meeting.

7. meet again December 13-14, 1989 in Paris.

the possibility of a video tape on waste management action to each country on its own.

•NATIONAL SUMMARIES(see attached reports for further detail)

Australia is continuing development work on SYNROC and has completed its first phase of large scale operation. More extensive operation of the plant will be done in Phase II. The feasibility of a low-level repository site is being studied at a location in the Northern territory of Australia.

Belgium has started operation of a storage facility for low-level waste which is expected to last until 1992; Belgium has completed a conceptual study for HLW waste storage; and is preparing a document on plans for LLW.

Canada is preparing for a spent fuel disposal concept assessment report), appointing a review panel and conducting a review with panel recommendations going to the Government for consideration in December 1992. Public information fact sheets are being produced concerning the concept.

The Federal Republic of Germany plans to start redrilling of the Gorleben shaft-1 in the next few weeks. The 840 meter below surface level will be characterized. Spent fuel storage at Gorleben is scheduled to start several months later. A license for Konrad Mine to dispose of LLW and ILW is expected in 1990 and operation is planned for 1993. At the Asse mine, a test disposal of drums of LLW waste will be used to evaluate the condition of the drums after five years of disposal in salt. A high-level waste disposal test using 30 glass logs is still planned for Asse.

Finland is continuing to excavate a below-surface disposal facility, similar to the Subseabed Forsmark Repository (SFR) in Sweden, for disposal of LLW and ILW from the Olkiluoto reactor site. Finland is well along with the construction of the facility - scheduled for completion in 1992. For spent fuel disposal, five sites are being investigated as candidates for a deep geologic repository.

France continues construction of its new LLW disposal facility at Aube to handle disposal of one million cubic meters of waste within 110 hectares. Four sites for HLW disposal are being studied with the intent to build an underground validation laboratory at one of the sites. Clay is currently receiving the most emphasis with experimental work underway in a clay mine.

Japan is continuing the development of its glass melter to solidify high-level waste from the reprocessing facility at Rokkasho-mura, Aomori Perfecture. A storage facility is also being planned. Operation of a low-level land burial facility is planned at Rokkasho-mura in 1991.

The Netherlands is reevaluating its nuclear option. A position is expected in late 1989. The licensing procedure for a new LLW/ILW storage site started in 1989.

Sweden has had good experience with the operation of the "SFR" facility for disposal of power plant waste over the last year. SKB will submit a new R & D program plan to the government this fall for its waste management program (required by law every three years). A new deep underground, hard-rock laboratory will be included in the plan.

The Swiss Government has accepted Project Gewahr as being feasible for the disposal of LLW and ILW. Permission has been granted to conduct field work at a fourth site in central Switzerland in marl. Field work has been completed at two sites but field work at a third site was stopped by public opposition. For new reactors, one new site has been withdrawn and two more are pending withdrawal because of public pressure. For HLW disposal studies, a planned 1500 meter deep drill hole in crystalline rock has progressed down to 1000 meters depth. Work is focused on crystalline and sedimentary rocks.

The Commission of European Communities (CEC) is preparing a new R & D program proposal for 1990 -1994 with a request for 19 million ECU (approximately $19 million). Current projects are emphasizing system studies, quality assurance on waste forms, performance assessments and tests in member countries' underground facilities.

Spain now has 10 nuclear power plants in operation and has adopted a direct disposal of spent fuel as its strategy. Emphasis is on interim dry storage of spent fuel using a multi-purpose transport and storage cask.

Norway has placed nuclear power on the government agenda for consideration again in 1989.

Portugal has placed nuclear power on the government agenda for consideration but the expected outcome to be negative.

The United Kingdom will soon announce the short list of candidate sites for their new LLW and ILW disposal facility.

IAEA announced the formation of a new group called the International Waste Advisory Committee (INWAC). The group is to advise IAEA Waste Management Division on future programs and activities to be undertaken by the Agency.

1989 NEA MEETINGS

ORGANIZATION	Date of 1989 Mtg	Place	Current OCRWM Lead
RWMC	1/24-25/89 12/13-14/89	Paris	T. Isaacs, C. Cooley
Director's Group	Fall 89 (?)	TBD	OCRWM Dir.
Reg. Dir. Group	TBD	TBD	NRC WM Dir.
PAAG (Performance Ass. Advisory Group)			
-SIS (Scenario Identification and Selecton)	3/14-16/89	Paris	P. Doctor C. Cole
-INTRAVAL--Valid. Organ. Integr. Group	April 11-12/89	Wash. D.C.	C. Voss
-GMD (Geochemical Modelling)	4/17-18/89	Paris	K. Czyscinski
-WkShp on Hum. Intru.	6/5-6/89	Paris	P. Doctor, E. Bonano (?), L. Rickertson,
-INTRAVAL (validation)	6/12-16/89	Helsinki	C. Voss
-PSAC (Model comparisions)	7/18-22/89	Albuquerque	B. Sagar
-Repository P.A.	10/9-12/89	Paris	TBD
-PAAG Meeting	10/16-18/89	Paris	D. Alexander
-Biosphere Modelling	11/7-11/89	Tokyo	TBD (DP?)
-HYDROCOIN (Review Team)	TBD	TBD	C. Cole
-TDB Review Experts (5 grps)	TBD	TBD	TBD
ISAG (Insitu Research Investigation Advisory Group)	5/28-31/89	Paris	C. Voss
ISAG (Insitu Research Investigation AdvisoryGroup)			
ISAG Sealing Workshop	5/22-25/89	Braunschweig	C. Voss, J. Tillerson, et.al.
P.I. Group (public info.)	Fall 89	Paris	G. King

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ATTACHMENT

CONTRIBUTION FROM AUSTRALIA TO RWMC MEETING, 24-25 Jan 1989

1. Report on the International Alligator Rivers Analogue Project (ARAP)

A summary of major activities in the first year and proposed in the second year was presented on pages 61-63 of the NEA Nuclear Waste Bulletin No.3, Dec. 1988. Emphasis is being given to the modelling aspects of the project and modelling workshops were held in Sydney on 8-12 February 1988 and Tucson on 21-22 November 1988, the latter being held in conjunction with the Second INTRAVAL Workshop. A drilling program was undertaken at the Koongarra site in October/November 1988 to provide additional drillcore specimens and an improved network of wells to obtain hydrogeological data. Two detailed technical progress reports for the first year of the program have been provided to participants. Quarterly progress reports are planned for the second project year. A major review paper was presented at the CEC Natural Analogue Working Group Meeting in Snowbird, Utah, in June 1988 and details of an ARAP test case were presented to the Second INTRAVAL Workshop in Tucson in November 1988. It is planned to hold the Second Joint Technical Committee Meeting in Sydney in July 1989 to review progress and to approve a technical program and budget for the third year.

2. The SYNROC Development Program

The objective of the SYNROC program at the Australian Nuclear Science and Technology Organisation (ANSTO) is to demonstrate that SYNROC is a commercially-viable second-generation medium for immobilisation of high level radioactive waste. The development work covers not only the material and its properties, but also the process and its operation and control.

The SYNROC development program began in 1979 and its first phase concluded in 1987 with completion of construction of the SYNROC demonstration plant at Lucas Heights. The program entered a four-year second phase in September 1987 with government approval and funding. A period of operating trials was completed culminating in a 36-hour plant commissioning campaign in May 1988 in which all modules were successfully operated in an integrated manner. The feed material for this campaign was made in a scaled up ANSTO facility which has so far produced 500 kilograms of SYNROC slurry by the advanced alkoxide hydrolysis route. This facility is now being streamlined to make its operation less labour intensive.

The objectives of the second phase of the SYNROC program are to gain experience in plant operation, to generate an engineering and scientific data base, to devise and operate alternative SYNROC modules on an intermediate scale, and to use this experience to develop and cost a design for a fully-active SYNROC fabrication plant.

The program of collaborative research on SYNROC with UKAEA continued at the Harwell Laboratory. Seven SYNROC samples containing fully active UK reactor waste, and four 'radiation damage' samples containing the relatively short-lived alpha-emitting actinide, curium-244, were made at Harwell and their leach testing has commenced.

Under the cooperative program with the Japan Atomic Energy Research Institute (JAERI), an ANSTO-scientist spent four weeks (in Nov-Dec 1987) at JAERI during its fabrication of four samples of SYNROC containing curium-244 for radiation damage assessment. A scientist from JAERI made a return visit of three weeks in March-April 1988 to the ANSTO SYNROC program. Two meetings of the Steering Committee and one meeting of the Coordination Committee were held in Japan.

ANSTO and the Italian instrumentality ENEA signed an Implementing Arrangement for cooperation in high-level radioactive waste management research and development. In this cooperation ANSTO and ENEA will evaluate SYNROC as a waste form and study the Italian process of management of high-level radioactive waste based on sol-gel technology.

3. Feasibility Study on Low Level Waste Repository

The Australian Federal Government has agreed to contribute $100,000 towards the cost of a study by the Northern Territory Government on the feasibility of establishing a shallow low-level radioactive waste repository in the Northern Territory. It is expected that the study will commence shortly and be completed in the first half of 1989. The sources of low level radioactive waste in Australia are mainly from the operation of ANSTO's research facilities at Lucas Heights, and the medical and industrial uses of radioisotopes elsewhere in Australia.

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DEVELOPMENTS IN THE CANADIAN NUCLEAR FUEL WASTE MANAGEMENT PROGRAM

E.L.J. Rosinger
Director, Waste Management Concept Review
Atomic Energy of Canada Limited Research Company
Pinawa, Manitoba

for W.T. Hancox

Presented to the OECD-NEA
Radioactive Waste Management Committee
Paris, 1989 January 24-25

TIME TABLE

The Review Panel will probably be appointed within the next two months. The Panel's first task will be to hold a series of scoping meetings involving all interested parties and the public at large. The purpose of these meetings is to develop a set of guidelines for the review, which will assist us to ensure that our documentation meets the needs of the review. We expect that the guidelines will be issued by the end of 1989.

Our target is to complete the Concept Assessment Documentation (nine volumes) and submit it for review in both official languages, English and French, in February 1991. The documentation will describe, from a technical perspective, the science and technology required to evaluate a candidate disposal site and to put in place a suitably engineered disposal system. A conceptual design of a used fuel disposal centre will be supported by comprehensive environmental and safety assessments of the disposal facility from its inception to long after its decommissioning.

After submission in 1991, the Scientific Review Group will examine the Concept Assessment Documentation and provide the Review Panel with an independent scientific review of the concept and associated science and engineering. After considering the Scientific Review Group's findings, and the Panel's own review of the Concept Assessment Documentation, the Panel will hold public hearings on a broad range of issues, associated with the disposal of used fuel. On completion of the public hearings, the Panel will make recommendations to the Minister of the Environment and Energy, Mines and Resources. A preliminary schedule, prepared by the Federal Environmental Assessment Review Office, indicates that the Panel's report could be issued by December 1992.

We are particularly pleased that the review has been initiated and believe that the proposed process will lead to a thorough and fair review of our work, and to decisions on the scope and timing of a post-concept program.

PREPARATION FOR THE REVIEW

We have stepped up our efforts in information and interaction programs with various publics. We are focusing on media, politicians and bureaucrats and providing briefings, seminars and audio-visual and printed material. Through formal public consultation programs we are gaining deeper understanding of the concerns people have about the disposal concept. We are working with other Public Affairs groups in Canada and the Canadian Nuclear Association to ensure that the public is well informed.

COMMISSION
OF THE
EUROPEAN COMMUNITIES

DIRECTORATE-GENERAL
FOR SCIENCE, RESEARCH
AND DEVELOPMENT
JOINT RESEARCH CENTRE
XII-D-2

Brussels, 20th January 1989
SO/mrh

NEA Steering Committee on Radioactive Waste

Paris, 24-25 January 1989

MAIN CEC ACTIVITIES IN THE FIELD OF RADIOACTIVE WASTE MANAGEMENT AND ASSOCIATED MATTERS

PRESENT STATUS AND HIGHLIGHTS (FROM APRIL 1988 ON)

1. GENERAL

During the period under consideration, the Commission sent to the European Council of Ministers for decision two proposals of research programmes :

- A proposal concerning a third research and technological development programme in the field of the decommissioning of nuclear installations 1989-1993 - this new programme will give a large place to community participation in selected pilot dismantling projects undertaken in various Member-States - the budget requested is 31.5 million ECU.

- A proposal concerning a research and training programme in the field of remote handling in hazardous and disordered nuclear environments (TELEMAN) 1989-1993 - the budget requested is 19 million ECU.

The Commission's services are presently drafting a new Research and Development programme proposal (1990-1994) on radioactive waste, which will be the fourth of its kind. The requested budget may amount to some 80 million ECU; a decision of the European Council of Ministers is expected end of this year.

The new JRC programme 1987-1990 on radioactive waste has been approved in July 1987 by the European Council of Ministers; the budget is similar to the previous one (48.5 MECU); the programme includes for projects, namely operation of PETRA*, actinide monitoring, waste characterization and safety of geologic disposal and will be carried out by the Ispra Establishment (Italy) and the Transuranium Institute (Karlsruhe, Fed. Rep. of Germany) of the JRC.

A proposal for a Council Directive on the transfrontier shipment of radioactive waste is also in preparation.

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* PETRA is a multipurpose chemical facility able to provide waste streams representative of those produced in a reprocessing plant, with possibilities of different chemical treatment.

In parallel with these large pilot projects, R&D co-ordinated projects like the COSA project (Comparison of Rock-Mechanics Computer Codes for Salt); the COCO project (Colloids and Complexes); the CHEMVAL project (geochemical modelling) and the COMPAS project (mechanical performances of container overpacks for geological disposal of vitrified HLW forms) were continued.

In addition, a co-operative project was set up for the detection and characterization of fractures and faults in clays; it was shown that suitable geophysical, hydrogeological and gas emanation measurement techniques do exist and are appropriate for this purpose.

Safety studies

The project PAGIS (Performance Assessment of Geological Isolation Systems), undertaken in 1982 within the framework of the CEC radioactive waste R&D programme came to its end in 1988 at a cumulated cost of some 10 million ECU.

The main conclusion, which will be presented during a topical seminar in 1989, is that there is no reason to doubt the possibility of achieving safe disposal of vitrified high-level waste in the various geological formations under examination (salt, clay, granite and seabed), if sound engineering practices are used and careful site selections are made.

A summary of the results may be found in the CEC leaflet FOCUS no. 9; the whole project in print (five volumes : summary, clay, granite, salt, sub-seabed no. EUR 11775, 11776, 11777, 11778, 11779).

3. MEETINGS, SEMINARS, CONFERENCES

Past events

- An international symposium on "Management of Low- and Intermediate-Level Radioactive Waste", co-sponsored by IAEA and CEC has been held in Stockholm (16-20 May 1988).

- The third meeting of the CEC "Natural Analogue Working Group - NAWG" took place near Salt Lake City and was hosted by US DOE (15-17 June 1988). The meeting report will be published as report EUR 11725 at the EC office for official publications.

- A symposium on "Future Industrial Prospects of Membrane Processes" (textile industry, gas purification, dairy industry, nuclear safety, ...) took place at Brussels (6-7 December 1988). Proceedings are in print.

- A workshop on "Testing of High-Level Waste Glass under Repository Conditions" mainly on the results of the WIPP-MIIT and the EC-RSST test compaigns was jointly organized by CEC, CEA and US DOE at Cadarache (F) on 17-21 October 1988. Proceedings to be published in 1989 under no. EUR 12017 EN.

13.1.1989

SOME NEW ASPECTS CONCERNING REGULATORY CONTROL OF RADIOACTIVE WASTES IN FINLAND

1 Regulations

In March 1988, a new nuclear energy legislation was introduced in Finland. The licensing system of nuclear power plants is illustrated in Fig. 1. A new advisory committee on nuclear safety was also established to the Finnish Centre for Radiation and Nuclear Safety.

With regard to nuclear facilities the stages of the licensing process are:

- decision in principle (for nuclear facilities of great general significance);
- construction license; and
- operating licence.

The licenses are granted by the Government. The Parliament and also the public are involved as regards the decision in principle. All disposal facilities and intermediate storage facilities of radioactive waste with total activity more than 10^5 TBq or α-acitivity more than 10^3 GBq are considered as nuclear facilities of great general significance.

The principal prerequisites for granting a license are:

- utilization of nuclear energy shall be considered to be generally beneficial for society, taking into account its various effects;

- utilization of nuclear energy shall be safe and it shall not cause detriment to the human beings, environment and property;

- physical security, emergency preparedness and other arrangements shall be sufficient to mitigate nuclear accidents and to safeguard the use of nuclear energy against illegal actions;

- it is not allowed to import nuclear explosives, or to manufacture, possess and explode them in Finland.

Based on the law, the Government will issue general regulations. These regulations, which will include also safety regulations for the radioactive waste management, are being prepared by the Finnish Centre for Radiation and Nuclear Safety. The Ministry of Trade and Industry decides on the national waste management policy.

2 Licenses of Nuclear Facilities in Finland

The operating licenses of Finnish nuclear power plants (Loviisa and Olkiluoto NPPs) were renewed in December 1988. The licenses are now valid by the end of 1998. The operating licenses of spent fuel and radioactive waste storages were issued for the same period.

Based on the old operating licenses of the nuclear power plants the Finnish Centre for Radiation and Nuclear Safety accepted in 1988 the Preliminary Safety Analysis Reports concerning the final disposal of radioactive wastes from Olkiluoto and Loviisa NPPs. The mining work at Olkiluoto for this purpose was started in 1988 and the disposal facility is scheduled to be ready in 1992. Due to the abundant interim storage capacity for radioactive wastes at the Loviisa NPP, the construction of the disposal facility will be started after some four years at the earliest.

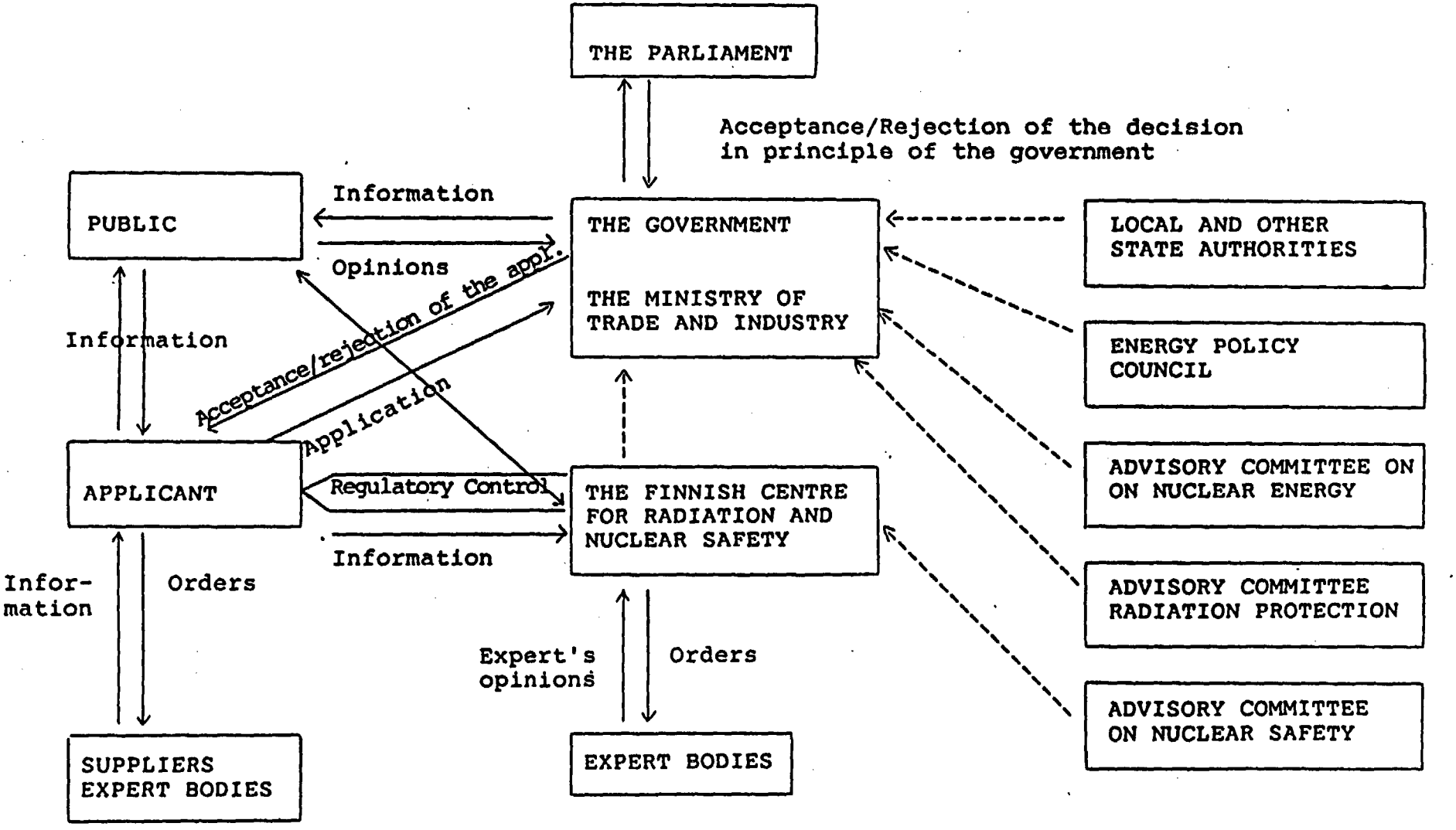

Fig. 1 LICENSING OF NUCLEAR FACILITIES IN FINLAND

WASTE MANAGEMENT RESEARCH IN FINLAND

The waste management research in Finland is funded both by the state (mainly the Ministry of Trade and Industry) and the utilities (represented in cooperation by the Nuclear Waste Commission of the Finnish power companies). Presently it is planned to further increase the co-ordination of the nuclear waste management related studies financed by the Ministry of Trade and Industry and other governmental organizations. Therefore a national nuclear waste management reasearch programme is being established among the publicly financed studies. The utilities continue to carry out a parallel research programme according to their main financial and operational responsibility for nuclear waste management. The utilities perform a considerable part of the design and research work by themselves. The rest of the research to the utilities is performed in various state research institutes.

A rather comprehensive review of the status and long-term plans of the waste management programme is given in the Finnish contribution to the compilation of national status reports. Since last autumn the following practical developments in realizing the programme can be mentioned. The excavation works for the repository of low- and intermediate-level operational wastes at Olkiluoto have continued since April 1988 after the issuance of the construction permit by the regulatory authority. Fig. 1 illustrates the repository lay-out and the present excavation situation. During the construction of the repository confirming bedrock investigations will be carried out as regards bedrock structure, rockmechanical and hydrogeological characteristics and hydrogeochemistry. The research and development for the spent fuel management programme is being continued by the Industrial Power Company within two main projects. The first project comprises the comprehensive investigations at five candidate sites for disposal of spent fuel. Fig. 2 shows the locations of the investigation sites and a short summary of the investigations performed during 1987-88. In the second project the assessment methodology is being developed further to enable site-specific comparative analyses, especially as regards predicting the groundwater flow conditions. Futhermore, the whole performance assessment package and scenario development are important subjects in the ongoing studies. In addition, the technical plans are being developed as well and studies are under way regarding the encapsulation plant, modified designs for waste canisters and repository lay-out.

In the national programme of publicly funded waste management research the coordinating responsibility is planned to be given to the Technical Research Centre of Finland. Other main research institutes participating in the programme are the Geological Survey of Finland and laboratories at the Helsinki University and the Helsinki University of Technology. The most important of these institutes, as well as the topics of their main research projects, are shown in Table I.

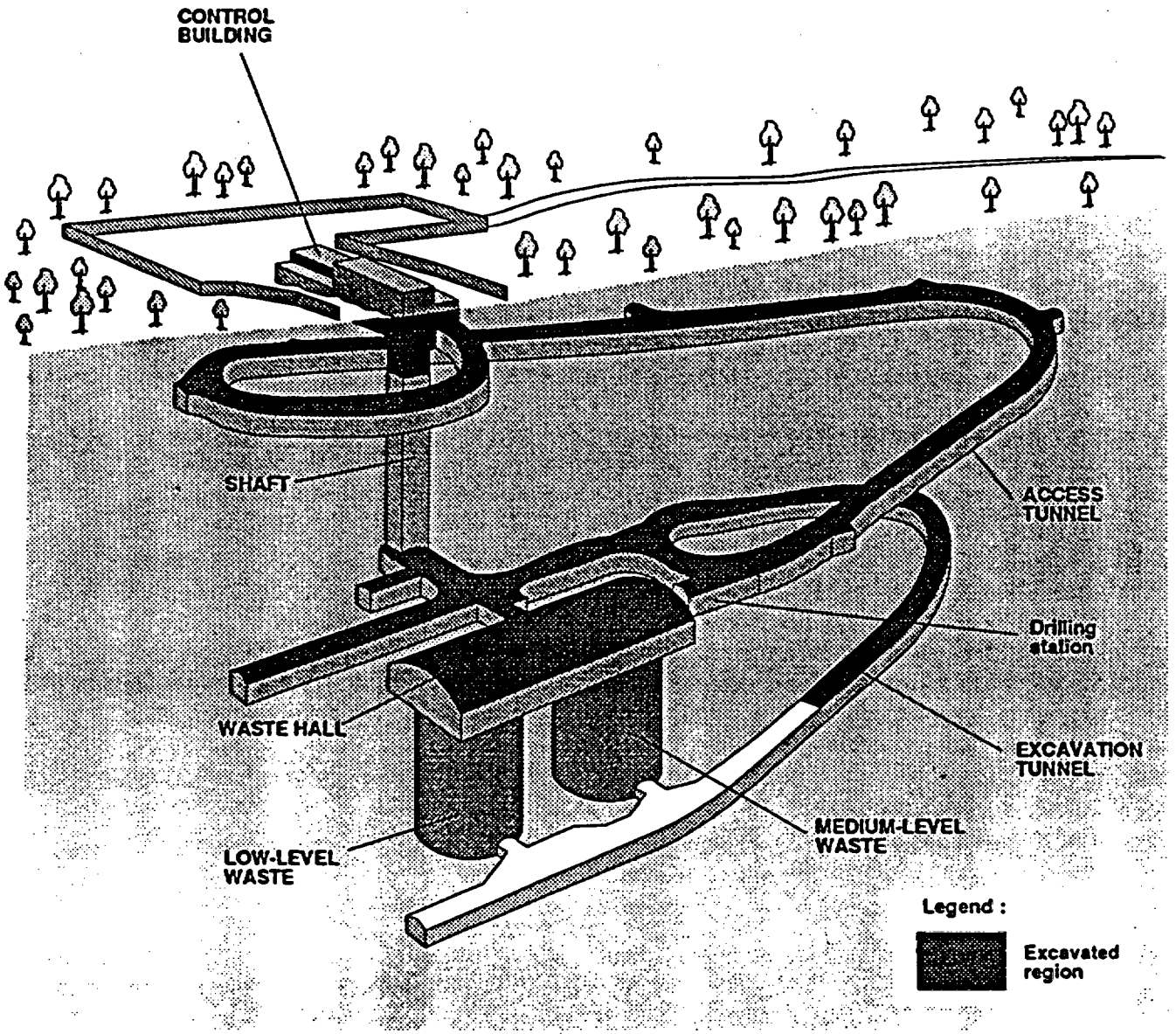

Fig. 1 Excavation situation on January 13, 1989 in the Industrial Power Company's (TVO) repository for low- and intermediate-level operational wastes at Olkiluoto.

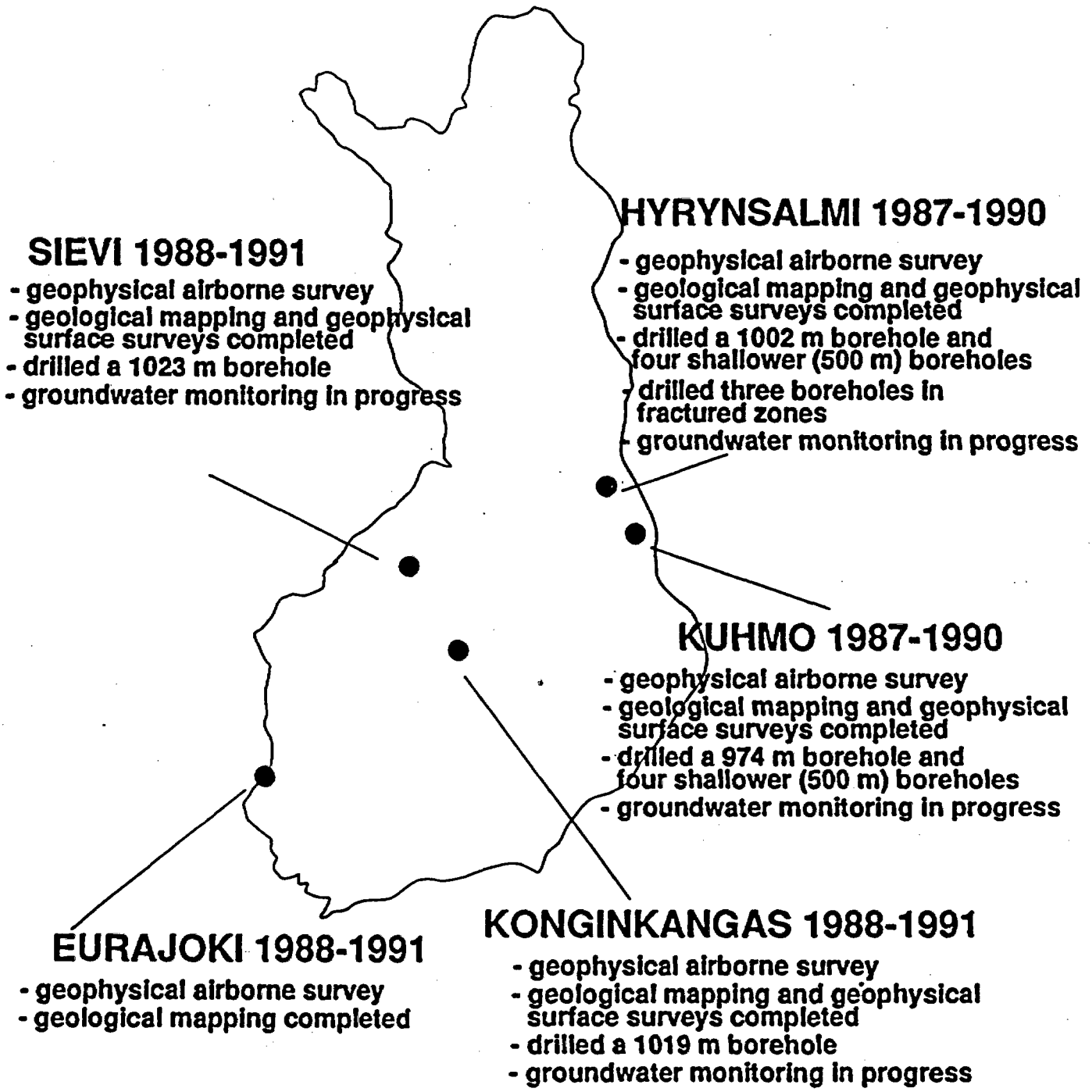

Fig. 2 Candidate sites for spent fuel repository selected for preliminary studies and field investigations carried out during 1987-88 by the Industrial Power Company Ltd.

Table I Research in the field of nuclear waste management in the governmental research institutes.

Research Institute	Research Projects/Topics in 1989
Technical Research Centre of Finland	
* *Nuclear Engineering Laboratory*	· Co-ordination of publicly financed nuclear waste management studies · Performance analysis of final disposal · Modelling of near-field phenomena · Groundwater flow analysis · Migration of radionuclides in a rock fissure · Geosphere migration analysis · Biosphere analysis · Probabilistic system analysis · Safety of the other waste management phases · Cost evaluation
* *Reactor Laboratory*	· Chemistry of final disposal of nuclear waste - chemical conditions in a repository - dissolution of spent fuel - interaction of ceramic waste products and groundwater - significance of colloids in repository and in bedrock · Migration in the natural and engineered barriers of the nuclear waste disposal - engineered barriers - bedrock as a barrier - coupled models · Decommissioning of nuclear reactors
* *Metals Laboratory*	· The strength of nuclear waste canister materials

Technical Research Centre of Finland (cont.)

* *Geotechnical Laboratory*

- Geomechanical and hydrogeological performance of rock and engineered barriers
  - development of computer aided tools to derive 3d-models related to bedrock characteristics
    - development of geological, geophysical, hydrogeological and rock mechanical measurement and interpretation techniques
  - sealing of repositories and their long-term behaviour
    - experimental rock dissolution
    - geochemical modelling of water - rock interaction
    - rock properties: pore structure, matrix diffusion, redox capacity
    - natural analogues
    - repository sealing

Geological Survey of Finland

- Geological site investigations
  - geological mapping and petrography
  - interpretation of geophysical measurements
- Structural modelling of bedrock
  - present day regional movements
  - regional geophysical interpretations
  - fracture orientation and stress fields
  - glaciogenic effects
- Mineralogical studies on radionuclide migration and sorption
- Natural analogue studies (radionuclide behaviour around uranium ore deposit)
  - geological framework
  - dating of groundwater and fissure fillings
- Deep groundwater studies
  - geochemistry and origin of deep groundwater
  - hydrology and flow of deep groundwater

Helsinki University

* *Department of Radiochemistry*

- Studies on radionuclide behaviour in rock and in groundwater
  - matrix diffusion
  - pore structure of rock
  - sorption experiments in column containing a single fracture
  - sorption studies for actinides
  - intercalibration of batch-sorption method
- Natural analogue studies
  - radiochemical analysis of rock and groundwater samples
  - analysis of nuclide movement by U&Th-disequilibrium and cosmogenic nuclides
  - chemical forms of nuclides in U- &Th-series
- Solidification of nuclear waste solutions with inorganic ion exchangers

* *Department of Microbiology*

- Microbiology of deep groundwater

Helsinki University of Technology

* *Laboratory of Engineering Geology and Geophysics*

- Natural analogue of spent fuel (radionuclide behaviour in rock, especially in uranium ore deposit)
  - basic geological characterization of the site (Lake Palmottu)
  - occurrence, mineralogy and composition of radioactive minerals
  - mobilization and migration of nuclides
  - studies on solid constituents of groundwater
- General geophysical prerequisites for geological waste disposal

* *Laboratory of Mining Engineering*

- Rock excavation methods

OECD - NEA

20th Session of the radioactive Waste Management Committee

PARIS - 24th-25th January, 1989

RECENT DEVELOPMENTS IN RADIOACTIVE WASTE MANAGEMENT IN FRANCE

I - SHORT-LIVED RADIOACTIVE WASTE

In France, the technical option for final disposal of short-lived radioactive waste is near surface disposal using engineered barriers.

France's first surface repository - "The CENTRE de la MANCHE" has been in operation since 1969 on a 12 hectares area located at the western tip of the Cotentin Peninsula, closed to the La Hague reprocessing plant.

The CENTRE de la MANCHE has a total capacity of about 485 000 cubic meters of waste and up to now has received approximatively 390 000 m^3 waste. According to present rate of deliveries it will be filled in the beginning of the 90's.

From now preliminary works are started on for the closure of the facility.

The decision to construct a second facility for disposal of short lived, low and medium activity radioactive waste was publicly announced by the Secretary of State of Energy on June 19, 1984, and the decree of Declaration of Public Utility concerning the CENTRE de l'AUBE was signed by the Prime Minister on July 22, 1987.
Land was bought during summer 1987, and cleared of wood on the same year. All along 1988 road accesses and earthworks were realized and civil engineering began and is now in full progress. It is forecasted to set in operation the "CENTRE de l'AUBE" by early 1991.

The facility covers an area of about 110 hectares with a disposal capacity of 1 million cubic meters of waste.

Adresse postale : C.E.A. 21, 23 rue de la Fédération 75752 PARIS Cedex 15

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As far as public acceptance is concerned, the situation appears to be clear. Wide consultation procedures were engaged from the outset, in order to discuss with local representatives and administrations the ways in which the project can be integrated with the local surroundings. A large part of the population and elected people are now sure of the safety of the disposal and consider that it is a good economical opportunity for the region.

2 - LONG LIVED RADIOACTIVE WASTE

The technical option retained for long-lived radioactive waste for final disposal is continental deep underground repository.

Considering the broad variety of possible host rocks in France, it has been decided to investigate the possibility of creating an underground repository in different rock types : sedimentary rocks - such as clay and salt - and hard rocks - such as granit and schist. So the first step of the site selection process was to compile a national inventory of the possible sites, based on criteria among which long term stability and favorable hydrogeology were the most important. This phase ended on 1986.

On spring 1987, the Government asked ANDRA to start field investigation in four preselected sites as below :

AISNE, in the north part of the country, where host rock is made of two layers of jurassic argileous formations more than 200 meters thick and respectively located between 400 and 750 meters deep,

AIN, in the center-east of the country, where oligocen bedded salt is protected above and below by thick layers of argileous formation ,

DEUX-SEVRES, in the center-west, corresponds to a large outcropping granitic massif covering an area of 250 square kilometers with more than 3 000 meters deepness,

MAINE et LOIRE, in the west of the country, concerns brioverien argileous schist located in the center of a 10 km large anticline. The schisteous formation is more than 600 meters thick.

This public announcement gave rise to an important excitement and some popular commotions on the four sites. A large effort has been devoted to inform, to discuss and to describe the investigation program which involves measurements from the surface by geophysical technics and drillings.

The first part of this program was achieved at the end of 1988 and the preliminary results of the geophysical studies give a confirmation on the general structure of the ground as forecasted during the preselection phase.

The first deep drilling (1 000 m) for sismic calibration was accomplished in clay (AISNE) at the beginning of January 1989, and the first core drilling will be developped in the same area in a few weeks.

The aim of this phase is the selection of one amongst this four sites to be proposed to the government for the construction of an Underground Site Validation Labory. This USVL will be built and operated with the purpose of site validation for the construction

DISPOSAL OF RADIOACTIVE WASTE IN THE FEDERAL REPUBLIC OF GERMANY

Horst Schneider, Physikalisch-Technische Bundesanstalt, Federal Republic of Germany

1. INTRODUCTION

Since the early 1960, the radioactive waste disposal policy in the Federal Republic of Germany has been based on the decision that all kinds of radioactive waste are to be disposed of in the deep subsoil, priority being given to the disposal in rock salt formations.

Shallow land burial is not practised in Germany, mainly due to the prevailing climatic conditions, the population density and the occurrence of suitable deep geological formations.

The fourth amendment of the Atomic Energy Act of 1976 , section 9a obligates the Federal Government to set up installations for the disposal of radioactive waste. According to section 23, the Physikalisch-Technische Bundesanstalt (PTB) has been charged with the execution of this task, technically supervised by the cognizant Federal Minister of the Environment, Nature Conservation and Reactor Safety.

Two repositories are at present being developed: one in the Gorleben salt dome, which is to accept all types of solid radioactive waste, in particular heat-generating waste, and another in the abandoned Konrad iron ore mine, into which waste is to be emplaced which exerts a negligible thermal influence on the host rock formation.

were performed. More than 40 drillings sunk down up to 80 m deep into the salt dome contributed to obtaining information on the geological situation in the contact zone between salt dome and overlying strata.

A comprehensive seismic measuring program including 156 km of profiling and a geoelectrical survey and gravity field measurements served to determine form and size of the salt dome and the structural situation of the covering and adjacent strata. Up to now, the site investigations have yielded the following basic results (2):

- The sequence of strata detected in the salt dome generally corresponds to the Zechstein complex usually occurring in Lower Saxony.

- The internal dome structure appears to be less complicated compared to many salt domes known from mining activities in this region. The general trend parallel to the dome' s border is the dominating structural element. The northwestern part of the Gorleben dome is controlled by a main anticline consisting of Stassfurt halite. Stassfurt halite also forms a dipping fold (inverse) anticline at the southeastern flank of the dome. Both anticlines are separated by an inverse syncline of younger halite with an overturned fold of Stassfurt halite. From the present state of information it may be inferred that there are sufficiently large rock salt volumes available to provide space for disposal fields.

- Long-term leaching of the Gorleben salt dome is controlled by the upward movement of the salt mass. The rise has amounted to a mean value of 0,01 mm per annum for millions of years.

- The dome surface is situated at about 230 m below sea level, with a local elevation up to 170 m below sea level. The thickness of the cap rock varies from 0 to 60 m and is locally eroded.

- The barrier of clay sediments above the dome is discontinuous. However, preliminary safety analyses show that the bar-

After the two shafts have been sunk, according to the plans, drifts of about 25 km in length will be driven and connected by crosscuts for the underground exploration. They will divide the salt dome into exploration areas, each of which is about 1 km long and on an average 0.7 km wide. In addition, a total of about 120 km of pilot holes and exploratory core holes will be drilled towards the sides and the interior of the salt dome, including some deep core hole drillings.

The underground exploration of the salt dome' s interior will be carried out at a depth of 840 m which is about 30 m above the planned disposal level. The drifts of the exploratory mine will later be used for ventilation purposes. The geoscientific and geotechnical investigation and surveillance in connection with the underground exploration (3) will be concentrated on locating drifts and reconnaissance holes, mapping of the faces in the shafts and drifts, core logging, determination of the chemical und mineralogical composition of the salt rock and of the chemical composition of solutions and gases. Geophysical prospecting mainly involves the use of electromagnetic reflection and geothermic methods. Extensive work will be required for the geomechanical investigation and surveillance of the salt and of the mine openings. In this respect, laboratory and in situ tests will have to be performed.

4. THE KONRAD PROJECT

In contrast to the planned Gorleben repository, the abandoned Konrad iron ore mine is only intended to serve as a repository for such waste which exerts negligible thermal impacts on the host rock formation.

Another difference between the Konrad and the Gorleben project is that the geological structure of the site is already known to a large extent from the existing mine and investigations performed by the "Gesellschaft für Strahlen- und Umweltforschung (GSF)" from 1975 to 1982.

The exploration of the site could therefore be limited to supplementary and more detailed work required for the licensing proce-

3. Greve, D., Jaritz, W., Preuss, J., Dr. Stier-Friedland, G.: Geowissenschaftliches Untersuchungsprogramm bei der untertägigen Erkundung des Salzstockes Gorleben, Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, July 1987 (unpublished)

Items from the IAEA Programme on Radioactive Waste Management

Prepared for Agenda item 14

of NEA Committee on Radioactive Waste Management

Jan. 24-25, 1989

1. The Technical Review Committee on Underground Disposal (TRCUD) which has guided the programmes of work in the underground waste disposal area for the last ten years has been disbanded in order to make way for a new advisory committee. The new committee, to be known as the International Radioactive Waste Management Advisory Committee (INWAC), will have wider terms of reference and will provide advice to the Agency on the whole of its radioactive waste management programme. The first chairman of INWAC will be Dr. R. Rometsch of Switzerland.

2. This year has seen a greater Agency involvement in the waste management problems of developing countries. The Waste Management Advisory Programme (WAMAP) which provides advisory missions to Member States has become well established with a total of 17 missions, mostly to developing countries since its inception in 1986.

3. The potential hazards associated with sealed radiation sources have become recognised in recent years as a result of several accidents involving human exposure and fatalities. The Agency has introduced a special programme in the Divisions of Nuclear Safety and Nuclear Fuel Cycle on source control and disposal. As part of this programme, work on a new series of mini-manuals offering practical guidance on the treatment, conditioning and storage of the various types of radioactive waste which can be generated from applications in research, medicine and industry has been started. A video film illustrating methods for the conditioning and storage of some types of sealed sources has been prepared as an aid for use in training courses, lectures etc. A special report entitled "The Radiological Accident in Goiânia" describing in detail all of the important radiological protection and waste management aspects was published in September 1988.

4. An international consensus was finally achieved in the area of Exemption of Radiation Sources and Practices from Regulatory Control and a publication on the subject was issued in September in time for the General Conference (Safety Series No. 89). The consensus on Principles for Exemption was reached at an IAEA/NEA jointly sponsored meeting in Vienna earlier in the year. The Principles will find immediate application in efforts aimed at rationalising the procedures for the management of very low level radioactive wastes, consumer products, and low level recycled contaminated materials.

5. At the General Conference of the IAEA in September, a resolution was passed calling upon the Agency to establish an "internationally agreed code of practice" for international transactions involving nuclear wastes. This followed public concern earlier in the year as a result of various reports of illicit exports and dumping of toxic and hazardous

10. A new Co-ordinated Research Programme (CRP) was started in 1988 on the Validation of Models for the Transfer of Radionuclides in Terrestrial, Aquatic and Urban Environments. This CRP, which is sponsored jointly by the Waste Management and Radiation Protection Sections was recommended to the Agency by the Experts Panel following the Post-Chernobyl Accident Review in 1986. It will utilise the environmental information which is becoming available following the Chernobyl release for the purposes of improving the reliability of environmental transfer model predictions. The Programme, which has the acronym VAMP (Validation of Model Predictions), has four working groups studying the following environmental compartments 1) Terrestrial 2) Urban, 3) Aquatic. A fourth working group, the Multiple Pathways Working Group will analyse all possible pathways leading to the intake of ^{137}Cs by man for comparison with whole body measurements in a number of locations in Europe and the Soviet Union. The methods used for model validation will be by model testing against the results of environmental measurements and also, by peer reviews of important transfer processes in the light of new data obtained since the Chernobyl release. Experts from more than 25 countries, including the Soviet Union are participating in the programme.

11. A report on safety principles for high level waste disposal has been under development at the Agency for some time. Problems are still being encountered in reaching the consensus between Member States on all key principles needed for approval of reports in the Safety Series, Safety Standards category.

12. As part of the Agency's post-Chernobyl programme, a report has been completed on "The clean-up of large contaminated areas as a result of a nuclear accident." Two other reports dealing with operational planning aspects and with the transport and disposal of large volumes of contaminated material are in preparation.

13. A second edition of the IAEA Radioactive Waste Management Glossary has been published as IAEA-TECDOC-447.

Recent developments in The Netherlands concerning Nuclear Power and Radioactive Waste (January 1989).

In May 1986, the Netherlands Government decided to reevaluate the nuclear option following the Chernobyl accident. This took place just before the Netherlands Parliament, that had already accepted an expansion of nuclear power, would decide on the sites for the new plants.

By mid 1988 twenty reports had been published in the nuclear energy review project. The main topics of these reports are: the international reactions to Chernobyl, the safety aspects of nuclear power plants, the external effects, accident management, and the economic damage resulting from an accident. An English translation of the executive summary of the project is available for interested delegations in a limited edition. Eleven different advisory bodies and councils were asked to give their recommendations based on the results of the studies. According to planning all recommendations will be available within a few months. Subsequently it is expected that the Government will take a stance on this item in 1989.

For the construction of a central facility for interim storage of all nuclear waste in the netherlands in the coming 50-100 years, a license under the Nuclear Energy Act is required. COVRA, the responsible national radioactive waste management organization, submitted its license application for the construction and operation of such a facility near the Borssele nuclear power plant at the end of 1987. During the licensing procedure it became clear that - for reasons of local acceptance - another site within the same municipality would be preferable. Subsequently such other site was chosen. The licensing procedure was therefore interrupted. It was restarted in the beginning of this January, after the submission of the amended application. Research on the feasibility of the final disposal of nuclear waste following the interim storage period, is in progress. The first stage of research into geological disposal is virtually completed. The results of this research wil be subjected to a review by NEA and EC. Subsequently a decision by Government and Parliament is necessary concerning the possible continuation of this research as a part of the Dutch policy on radioactive waste.

NATIONAL ACTIVITIES IN JAPAN

JANUARY, 1989

JAPAN

Disposal of High-Level Radioactive Wastes

* High-level radioactive wastes (liquid) produced at a reprocessing plant are reduced in volume by evaporation and concentration, and securely stored in exclusive tanks at the plant. As of March, 1988, approx. 320 m³ is stored at the reprocessing plant of the Tokai works of Power Reactor and Nuclear Fuel Development Corporation (PNC).

* Fundamental Policy of High-Level Radioactive Waste Disposal:

The fundamental policy is to vitrify high-level radioactive wastes into a stable form, store it for 30-50 years for cooling, and then put it into a geological formation deeper than several hundred meters.

In addition to the vitrified wastes from the reprocessing plant of PNC, those from the commercial reprocessing plant (planned to be operational at Rokkasho-mura, Aomori Prefecture, by the Japan Nuclear Fuel Services Co., Ltd), and those which are returned from overseas are expected to be disposed of into the geological formation.

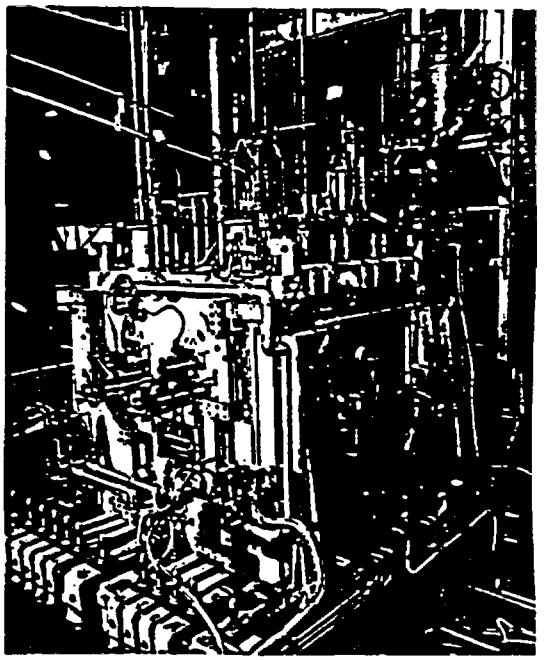
This geological disposal is performed in four stages: "selection of effective formations" (1st stage), "selection of the candidate disposal sites" (2nd stage), "demonstration of disopsal technology at the candidate disposal sites" (3rd stage), and "construction, operation, and closure of the disposal facilities" (4th stage).

* Present Situation

Waste Treatment:

Steady research and development activities, related to the safety and reliability of vitrification system are under way at The Power Reactor and Nuclear Fuel Development Corporation (PNC) and The Japan Atomic Energy Research Institute (JEAERI). As a result of a comprehensive survey of the achivements, PNC is constructing a vitrification facility targetted to start operation in 1991.

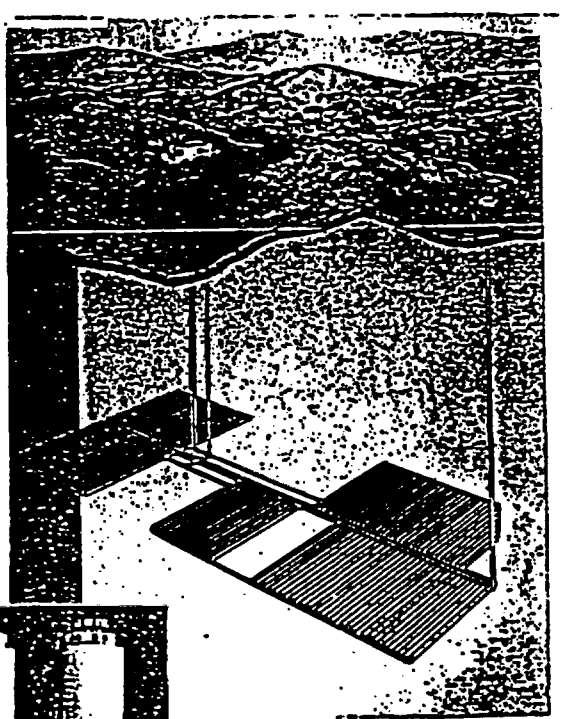
A construction plan for a storage plant of vitrified wastes is also under way.



● Glass Melter ④

Disposal:

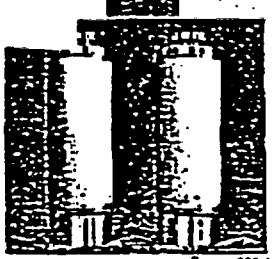
The first stage, selection of effective formations, was completed in 1984. Currently, the second stage, starting in 1985, is under way. This includes research and development acitivities as well as investigation necessary for disposal.



● Example of the concept of underground repository:

Tunnels are excavated a depth of several hundred meters. Wastes are stored in the tunnels. The tunnels will finally be buried and completely closed.

⑤



● Vitrified Wastes (Canisters)

Other Activities

* Wastes from Decommissioning of Reactors:

The radioactivity level of most of the radioactive wastes generated from the decommissioning of nuclear facilities, etc is quite low. Studies are being conducted for rational disposal of such wastes depending on the level of radioactivity, or for cycling, as cases may demand.

The decommissioning of commercial power reactors is expected to be required in Japan in the latter half of the 1990's. The Japan Atomic Energy Research Institute has been engaged in technical development for dismantling power reactors using a power experimental reactor (JPDR) as a model since 1981.

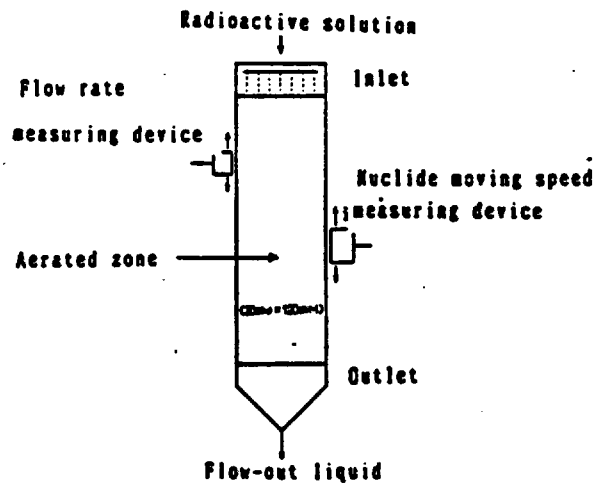
* Safety Research

In connection with the implementation of safety research related to nuclear facilities, the government will carry out research contributing to the safety review and related aspects in conformity with the plan defined in the Annual Safety Research Program drawn up by the Nuclear Safety Commission. On the other hand, in connection with research related to the improvement of the safety level, mentioned in the Annual Program, research themes whose implementation by the private sector is regarded as difficult will be dealt with by the government by taking their importance into consideration.

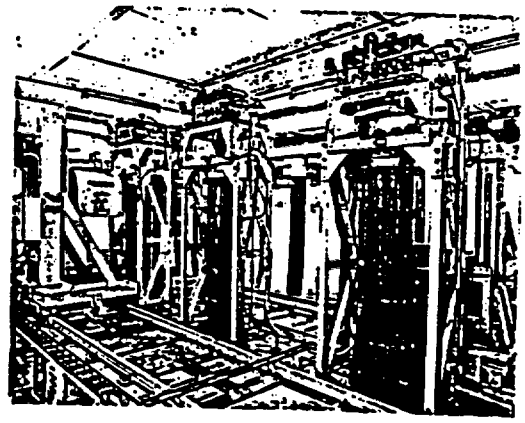
In connection with safety research related to the treatment and disposal of radioactive waste, the research regarded as necessary in correspondence with the implementation of the plans for disposal of wastes will be carried out in a systematic and active way.

* Nuclide Partitioning and Transmutation

Separation of nuclides contained in high-level radioactive waste according to their half-life, utilization purpose, etc. (nuclide partitioning), for the utilization of useful nuclides and conversion of long-lived nuclides into short-lived nuclides, or non-radioactive nuclides (transmutation), are extremely important research themes from the standpoint of conversion of high-level radioactive wastes into useful resources and their disposal efficiency. The research and development of nuclide partitioning and transmutation for the future will be carried out in accordance with the program drawn up by the Atomic Energy Commission.



Apparatus for Aerated Zone



Public Information
For more information on the nuclear waste management, contact:
Atomic Energy Bureau
Science and Technology Agency
2-1, Kasumigaseki 2-chome, Chiyoda-ku,
Tokyo 100, Japan
Telephone:03-581-2588, Telex:02226720, Telefax:03-592-1239

[National Activities in Japan]

Supplement 1
(別添1)

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

NUCLEAR ENERGY AGENCY

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Paris, drafted: 22nd December 1988

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English only

STEERING COMMITTEE FOR NUCLEAR ENERGY

COMMITTEE FOR TECHNICAL AND ECONOMIC STUDIES
ON NUCLEAR ENERGY DEVELOPMENT AND THE FUEL CYCLE (FCC)

Information Exchange on "Options Making Extra Gains from Actinides"

(Proposal by Japan)

The attached note prepared by Japan is circulated for discussion under Any Other Business at the next meeting of the FCC.

OPTIONS MAKING EXTRA GAINS OF ACTINIDES AND FISSION PRODUCTS GENERATED IN NUCLEAR FUEL CYCLE

1. BACKGROUND

In 1982 the IAEA issued a report on the "Evaluation of Actinide Partitioning and Transmutation" which presented an assessment of the subject from the viewpoint of possible benefits from an alternative to conventional technologies of fuel cycle, reprocessing and vaste disposal. It concluded that "the implementation of partitioning and transmutation would be an immense undertaking, involving a large portion of a country's nuclear pover program, but providing at best a rather small reduction in potential long-term radiological hazards". There is nov wide-spread acceptance in the international technical and scientific community that sound and safe technology is available for vaste disposal in geological formations. Countries' radioactive vaste management policies, including their R&D policies on this topic, are based on that viev.

As a result, partitioning and transmutation is nov recognized as a theme for long-term basic research, whose successful achievement would benefit future generations of human beings, rather than as a near-term alternative to established or planned back-end policies. From this viev-point consideration should be given to the possibilities that the actinide contained in the high level vaste from reprocessing might have potential for extra gains in pover generation if they vere to be recycled; that some useful elements of fission-products are also contained, including technecium-99 and noble metal elements which have potential as catalysts or in developing nev materials; and that nuclides such as caesium-137 and strontium-90 with promising useful applications as radioisotopes could be made available.

Development of this concept would, therefore, be of value in presenting options for making extra gains from the actinides and fission-product elements generated in the nuclear fuel cycle, thus yielding a more efficient approach to utilizing limited nuclear resources.

It is in this context that Japan Atomic Energy Commission (JAEC) concluded, in June 1987, that R&D efforts for nuclides partitioning and transmutation of reprocessing high level vastes should be re-strengthened, and that the potential benefits could be achieved if vell-planned, efficient and effective R&D efforts are performed. JAEC then submitted in October 1988, a report entitled "Long Term Program for Research and Development on Nuclide Partitioning and Transmutation Technology", which proposes activities for the next decade and even beyond.

The Japanese government has, therefore, decided to commit to perform comprehensive R&D in this field.

To this end, it would be the most helpful to get cooperation of other advanced nations with their technical performance and capability being developed on the subject, on the basis of information exchange. Results of such a cooperative programme, if established, would be of common interest and should be shared with the members concerned.

Accordingly, it is proposed to promote such a cooperative programme under OECD/NEA framework.

2. PURPOSE OF INTERNATIONAL COOPERATION

An international cooperation is proposed to exchange scientific and technological information of nuclear physics research and advanced process technologies for the purpose of accelerating research and developmental work for partitioning and transmutation of actinides and fission products (FPs) generated in nuclear fuel cycle, as well as underlying studies concerning physical and chemical properties of the relevant elements.

3. CONTENT OF THE PROGRAMME

It is proposed that scientific and technological information exchange will be made on the R&D of the following issues:

i) Physical and Chemical Properties of Elements Generated in Nuclear Fuel Cycle

Nuclear data and thermodynamic data of the actinides and long-lived FPs are to be measured, compiled and evaluated for the reactor physics and material development. Solid state physics and solution chemistry are to be studied of various compounds of the artificial actinide elements.

- Chemical properties and behaviour of the actinides species in aqueous and organic solution;
- Analytical techniques and methods;
- Physical and chemical properties of various actinides compounds;
- Collection and evaluation of nuclear and thermodynamic data of relevant elements.

ii) Nuclide Partitioning Technology

Advanced separation technology of elements generated in nuclear fuel cycle is to be developed on the basis of current progress in the chemical separation processes, new extracting solvents, laser application, sublimation and volatilization process.

- Partitioning of high-level liquid waste with wet and dry processes;
- Platinum group metals recovery technology;
- Purification, isotope separation and fabrication of recovered elements.

iii) Nuclide Transmutation

It has been clear that transmutation of the actinides generated in nuclear fuels in LWRs and FBRs is technologically feasible. Recycling the actinides, neptunium, americium and curium, to thermal and fast reactors is studied, as well as the transmutation of the actinides and long-lived FPs with accelerators in the light of currently developed accelerator technology.

- Target material development;
- Transmutation with FBRs;
- Transmutation with actinides burner reactors;
- Transmutation with proton accelerators and/or electron accelerators.

4. BENEFITS OF THE PROGRAMME

Long-term scientific and technological work under the programme would serve as an element of so-called Nuclear Frontier, which is to aggressively seek for new benefits of nuclear options:

1. Advancement of the creative and innovative processes and technologies included in the programme would spread into R&D on other technological areas and serve to accelerate advancement thereof.

2. Continuous undertaking of this ambitious and innovative R&Ds in international arena would help further activate nuclear R&D efforts in general, and thereby attract good quality young people so that they could be committed and dedicated to bring the nuclear option into the 21st century in a healthy state.

5. FRAMEWORK OF THE PROGRAMME

1. It is proposed that cooperative agreement is prepared by OECD/NEA and that Member nations and/or R&D institutes interested in the programme shall be invited to part or all of the programme.

2. The international programme may be for the period of 3 to 5 years, and extension and/or expansion of the programme may be discussed at an appropriate timing during the programme.

3. The cooperation may be implemented by any of the following means:

   - exchange of information;
   - exchange of specialists;
   - organisation of, and participation in workshops, etc.

6. JAPANESE CONTRIBUTION

The Japanese government with its R&D institutes are prepared to support and contribute to the international programme:

-- Sponsor for an expert meeting or workshop to initiate the cooperative work investigating and identifying R&D topics on the subject;

-- Invite researchers of other partner nations to participate in the Japanese programme.

-- Any others, as appropriate.

SKI

1989-01-23
Sören Norrby, SKI
Jan Olof Snihs, SSI
Tönis Papp, SKB

RECENT DEVELOPMENTS IN SWEDEN

Repository for reactor waste

The Swedish repository for reactor waste, SFR, at Forsmark has now been in operation for almost one year. The capacity of the first stage of the repository is 60 000 m^3. The total activity must not exceed 10^{16} Bq. According to one of the conditions in the operation licence for the facility, the different waste categories (totally about 40 categories) are now beeing reviewed by the SKI and the SSI before they can be disposed of in the SFR. Five waste categories have upto now been accepted for disposal. Restrictions on the use of the silo part of the repository are still in force.

Management and disposal of low-level waste

Low-level waste is disposed by shallow land burial on the nuclear power sites at Oskarshamn and Forsmark and on the research reactor site at Studsvik with good experiences. Some waste is also burned or melted in special facilities at Studsvik.

Intermediate storage for spent fuel

The intermediate storage facility for spent fuel, CLAB, at Oskarshamn is of the wet storage type. The capacity is 3 000 tons of fuel. The facility can be expanded to accommodate all the spent fuel from the Swedish nuclear energy program, about 7 500 tons. The facility has now been in operation since 1985. About 1 000 tons of spent fuel is now stored in CLAB. A licence procedure is now running to license the facility for new fuel types with higher enrichment in U^{235}.

Decommissioning

According to a decision by the government the first two reactors will be taken out of operation in the middle of the 90-ies and the others before the year 2010. Formalistic and technical problems, decontamination, waste treatment and disposal, occupational and public exposure, criteria and principles etc., are examples of questions that have to be discussed.

SKB will present a new R&D program

According to requirement in the Act on Nuclear Activities the Swedish Nuclear Fuel and Waste Management Company, SKB, has to present a new research and development program every third year. The SKB is now preparing for this work and a new report will be published in September this year. The Swedish Board for Spent Nuclear Fuel, SKN, is responsible for the review of the program and will give comments on the program to the Government. The SKI and the SSI will give their comments to the SKN.

Swedish Hard Rock Laboratory

SKB plans to build an underground research laboratory in crystalline rock, HRL (Hard Rock Laboratory) during 1990-1993. A tunnel will be made to 400-500 m depth where rooms will be excavated for investigations and experiments.

The intention with the HRL is to:

- test and verify investigation methods to be used in the detailed evaluation of the final few candidates for a repository site,
- develop and test methods for adoption of a repository to the local variations of the host rock at a selected site,
- provide an opportunity for experiments in an repository-like environment, and
- further develop the data base for safety assessments of a HLW repository.

Geological, hydrogeological and geohydrological predictions will be made on the basis of the site investigations and their quality will be controlled during the construction.

Surface investigations have been done in an area close to the Oskarshamn nuclear power plant in South-East Sweden. During 1988 four core-holes were drilled to depths between 500 and 1 000 m. The investigations up to now indicate that the site could well be used for the laboratory. Further investigations will be done and the decision to start the construction of the tunnel is expected to be taken during 1989.

SKI's project-90

The SKI Project-90 is progressing according to schedule. Project-90 is an umbrella project in which SKI has organized the R&D efforts necessary to prepare the SKI for performance assessment activities related to SKB's program for disposal of spent fuel. Project-90 will be finalized in 1990-91 with a performance assessment of a reference repository with basic characteristics from the KBS-3 concept and with a synthetic reference site. The different activities within Project-90 include development of near field and geosphere models that take into account existing conceptual uncertainties. Different methodologies will also be used to analyze data uncertainties.

Scenario development

A project related to scenario development is presently being done jointly between SKI and SKB. The site is the SKI synthetic Project-90 site and the disposal concept is the KBS-3 concept. The NEA takes part as observer in the project and the results are reported to PAAG.

Supercomputer ETA-10P

The SKI has signed a contract with Control Data i Sweden for five year leasing and facility management of a 37% share of the new supercomputer ETA-10P. The computer has a UNIX operating system and will be installed in January.

Development of criteria for disposal of HLW

The SKI and the SSI are developing criteria for the final disposal of High Level Waste/Spent Fuel. There are two activities going on. One is a cooperation between the Nordic countries to formulate criteria that could be used as the basis for national regulations. Sweden and Finland are the most active countries in this work but also Denmark and Norway are involved. The criteria document will be published this spring. The intension is to distribute the report and ask for comments.

Work to develop guidelines or criteria is also beeing done in cooperation between SKI, SSI and the Swiss Nuclear Regulatory Authority, HSK. The character of this work is different from the Nordic work and will not directly aim at formulating criteria but to discuss important questions in relation to final disposal of HLW. Questions such as long term aspects, individual and collective dose, optimization, validation of models and so on are discussed. A status report is planned for the end of this year.

The HYDROCOIN and INTRAVAL projects

The HYDROCOIN Project published the Level 1 Technical Report in April, 1988. The report summarises the results from the first phase of HYDROCOIN, which was devoted to verification of computer programs for groundwater hydrology. This has been done by applying the codes to seven hypothetical test cases representing different physical situations. HYDROCOIN Level 1 has provided an efficient means for testing strengths and weaknesses of various strategies for groundwater flow modelling and postprocessing. As a result of the Level 1 effort, several code enhancements have been made.

Results of Level 2 (validation) and Level 3 (uncertainty and sensitivity analysis) exercises are being compiled by the principal investigator, Kemakta Consultants, and Technical Reports are being drafted by the HYDROCOIN Project Secretariat. Publication, together with a summary report of the whole project, is planned for 1989.

The INTRAVAL Project was started in October 1987. The purpose of the study is to increase the understanding of how various geophysical, geohydrological and geochemical phenomena of importance for the transport of radionuclides from a repository to the biosphere can be described by models developed for this purpose. This is being done by a systematic use of information from laboratory and field experiments, as well as from natural analogue studies. The INTRAVAL Project thus cooperates with several international and national experimental programs and analogue studies.

It is a pronounced policy of the INTRAVAL study to support interaction between modellers and experimentalists in order to gain reassurance that the experimental data are properly understood and that the experiences of the modellers regarding the type of data needed from the experimentalists are accounted for. To support this interaction and for the development of a strategy for the systematic application of the experiences and knowledge gained from the Test Cases, a committee called the Validation Oversight and Integration Committee (VOIC) has been established.

During 1988, two workshops have been held within the INTRAVAL Project. Most of the work for preparation of background documents for the test cases has been completed and the modelling of some of the test cases has started.

BIOMOVS

The SSI has invited a number of organisations to participate in an international study for testing models for ecological transfer and bioaccumulation of radionuclides and other trace substances. The study is named BIOMOVS, BIOspheric Model Validation Study is managed by SSI. The Nordic Liaison Committee for Atomic Energy (NKA) and the International Union of Radioecologists (IUR) give some financial support. At present 14 organisations from 12 different countries formally participate in the study.

The sixth BIOMOVS workshop was held in April 25-29, 1988 in Budapest, Hungary. The seventh BIOMOVS workshop was held November 7-11, 1988 in Tokyo, Japan. More than 20 organisations from 15 countries and IAEA participate in the work and workshops.

BIOMOVS involves two different approaches for fulfilling the objectives. One approach of testing (Approach A) involves the formulation of test scenarios based on suitable data and a comparison of model predictions against these independent data sets. The other approach (Approach B) involves the comparison of model predictions and associated estimates of uncertainty for specific test scenarios selected on the basis of assessment priorities. The results are presented in Progress Reports.

Workshop

An international workshop on principles for disposal of radioactive and other hazardous wastes was held in Stockholm 7-10 June, 1988, organized by SSI on behalf of the Minister of Environment and Energy. The purpose of the workshop was to discuss legal, scientific and practical aspects of disposal of low and intermediate level radioactive waste and othe types of hazardous waste. One important issue at the workshop was to see if the basic philosophy and approach used in radiation protection can be applied in principle even for non-radioactive wastes. Several recommendations on future work were given. Proceedings will be published in short.

Symposium on genotoxic substances

Genotoxic effects similar to those produced by low doses of radiation may also result from low environmental concentration of certain chemicals.

However, in many countries, radiation protection and environmental pollution control are the responsibilities of separate authorities and agencies, which act more or less independently in evolving safety standards, regulatory measures and monitoring procedures.

Therefore, Swedish authorities in cooperation with international organisations organized an international Symposium in Stockholm, October 3-5, 1988. The purpose of the Symposium was to discuss, from the viewpoint of the decision makers, the concept of a unified approach for genotoxic agents on an international basis. There were about 30 lectures and 130 participants from 20 countries.

Status of Waste Management in Switzerland - December 1988

NEA - RWMC Meeting in Paris, 24/25 January 1989

1 FEDERAL ADMINISTRATION AND REGULATORY AUTHORITY (U. Niederer)

1.1 Project Gewähr

On 3 June 1988, the Swiss Federal Council of Ministers took a final decision on the acceptability of Project Gewähr, the feasibility project submitted by Nagra in January 1985. Following the advice in reviews by government experts, the following decisions (as summarized in this extract from the Government Press Release) were taken:

"At its recent closed session on the topic of energy, the Federal Council made the following decisions with respect to Project Gewähr (Guarantee) 1985:

a) Feasibility and safety of disposal have been demonstrated for low- and intermediate-level wastes arising from the operation and decommissioning of nuclear power plants and from areas outwith nuclear energy production

b) The safety of disposal of high-level waste and of long-lived alpha-containing waste from reprocessing has also been demonstrated

The existence of a site for disposal of these wastes has not yet been demonstrated, i.e. a site with sufficiently extensive rock formations which have the properties required for disposal

c) There are no reservations as to the feasibility of repository construction from a civil engineering point of view.

The operation licenses for the existing nuclear power plants will remain in force until such time as the Federal Council reaches a decision on a suitable repository site.

The waste producers must continue to support research in the field of radioactive waste disposal. Investigations in the field of high-level and long-lived alpha-containing wastes are to be extended to include non-crystalline (i.e. sedimentary) host rocks; regions other than those investigated to date are also to be included in the programme.

The Federal Department of Transport, Communication and Energy (EVED) is responsible for supervising the research and examining the relat d reports; it also has the power to issue instructions on the procedure to be followed."

1.2 Site selection

The Federal Government issued a licence to Nagra to conduct field work at the Wellenberg mountain (canton of Nidwalden, in central Switzerland). The licence covers geopyhsical investigation, a number of test drillings, and construction of an access tunnel not more than 2'000 m long. The purpose is to evaluate the suitability of the site for the disposal of short-lived, low- and intermediate-level waste.

1.3 Decommissioning

The owners of the experimental nuclear power plant Lucens (cavern type, shut down in 1969 after an accident) applied for a licence for final decommissioning and de-nuclearization of the site. The application is still pending.

1.4 Waste treatment

The Nuclear Safety Inspectorate issued a revised version of guideline R-14: "Conditioning and Intermediate Storage of Radioactive Wastes". The revised guideline lists the protection standards and criteria and describes the procedures and tests to be followed in order to obtain authorization for conditioning and storage.

2 STATUS OF WASTE MANAGEMENT PROJECTS (C. McCombie)

2.1 General issues

In 1988 the 5 operating nuclear power plants in Switzerland again had a good performance record and provided around 40 % of Swiss electricity requirements. After a long period of social and political problems concerning the planned Kaiseraugst plant, the Federal Council, at the request of parliament, negotiated with the utility to which a general siting permit had already been granted terms upon which the project could be abandoned. This will result in cancellation of the project with the government paying compensation of 350 Mio Swiss francs which represents around 1/3 of expenditures to date. Further negotiations are underway for cancellation of the remaining new plant projects (Graben and Verbois), neither of which, however, has yet been granted a general permit.

On the waste disposal issue, progress was made when the long-delayed decision on Project Gewähr 1985 was announced (see section 1.1). The positive conclusions of the government reviews, and the direct recommendations contained therein, have led to the following strategy for future disposal planning. The development of a L/ILW repository should be pushed ahead as rapidly as possible; reservations concerning the future acceptability of long-lived wastes at the specific sites so far selected lead to initial concentration on short-lived wastes. For HLW the next step after the acceptance in principle of the achievability of safe disposal is the identification of specific potential sites. The current work on the crystalline base rock is being complemented by intense field work on sediment alternatives. More details of Nagra geologic studies in both the L/ILW and HLW programmes are included in sections 2.2 and 2.3.

2.2 Programme for disposal of low-level wastes

At the start of 1988, field work had been completed at 2 out of the 3 potential sites for which government permission for exploration was granted in 1985. In December 1988, Nagra applied for formal government permission to commence a tunneling phase at both these sites and also at the third site where local political opposition has prevented any surface site invesitgations to date. The application is accompanied by an overview report plus separate extensive reports on each study site. It is not, however, intended to tunnel simultaneously at different sites; a sequential procedure is proposed by Nagra in place of further parallel coupling of programmes. The first site to be evaluated in detail, furthermore, will be none of the three mentioned above but rather a fourth site in marl at Wellenberg. In mid-1988 permission was granted by the Federal Council for site work here (see section 1.2) and, if no large delays arise in local permitting, work will commence in early summer 1989.

2.3 Geological studies for HLW in crystalline rock

The seventh Nagra deep borehole was commenced at the Siblingen site on 1 September 1988. To date around 300 m of sediments and 500 m of granite have been drilled; the crystalline rock is a mixture of fractured, permeable rock with tighter sections intervening. At the other 6 deep boreholes long-term monitoring is in progress or in one case (Leuggern) a tracer dilution experiment has been performed. The regional synthesis of the crystalline studies, which is aimed at identification of potential sites for detailed characterization will proceed through 1989.

2.4 Sediment studies

Based on approximately 1½ years of detailed desk studies, a report on potential sedimentary host rocks in northern Switzerland has been prepared and submitted to authorities for review comments. In two rock types (freshwater molasse and opalinus clay) regions for more detailed study have been identified. During 1989 Nagra intends to narrow into one option for which a field investigation programme will then be prepared for subsequent submission in an application for an exploratory licence.

2.5 Intermediate storage planning

Plans have been prepared by a utility group for a centralized intermediate storage facility for spent fuel or vitrified HLW (in dry casks) as well as for L/ILW returned from reprocessing. Discussions are currently underway with the local community involved (Würenlingen) in order to negotiate conditions upon which local acceptance might be based. As a back-up to this centralized option some utilities are preparing plans for extended storage at the reactor sites and one such project has already been submitted for licensing approval.

3 DEVELOPMENTS AT THE PAUL SCHERRER INSTITUTE (PSI) (H.P. Alder)

On 1 January 1988, the Swiss Federal Institute for Reactor Research (EIR) and the Swiss Institute for Nuclear Research (SIN) were merged into the Paul Scherrer Institute (PSI). The R+D activities on nuclear waste management continue to be an essential part of the technical programme at PSI. The R+D activities related to performance assessment of waste repositories focus on three issues: (i) characterization of waste forms, (ii) repository near-field studies, (iii) repository far-field studies.

In this broad spectrum, emphasis is put on development of model concepts for relevant mechanisms and their validation by experiment, and on data acquisition for safety analysis. The models are then applied to comprehensive, long-term safety assessment studies of repository projects which yield insights into the behaviour of the total system and clarify the needs for further research. The work is done in close cooperation with and with financial support of Nagra.

3.1 Characterization of waste forms

Specific problems for all three main types of waste matrices are investigated. For bitumen, the emphasis has changed from characterization of physical properties to that of leaching behaviour and complexants formation from degradation products as well as radionuclide sorption on bitumen. Work on HLW glass includes comprehensive leaching studies and also detailed mechanistic modelling. For concrete, additional work is in progress on the influence of composition variations and on product characterization in the framework of the relevant safety authority regulation, R-14.

3.2 Repository near-field studies

The aim is to make a significant step forward in our considerations of the near-field barrier, beyond the more rudimentary approaches in Project Gewähr 1985. To this end, modelling of concrete degradation and porewater chemistry is continuing, taking into consideration more realistic concretes and speciation of selected radionuclides. These tasks also include evaluation of thermodynamic data, and advanced models are planned for coupling thermodynamics of the concrete near-field and physical transport of solutes. As a contribution to validation of models, an experimental programme on porewater chemistry, radionuclide sorption and diffusion was initiated in Spring 1988.

3.3 Repository far-field studies

With laboratory and field experiments as well as modelling of geosphere transport and biosphere transport, these activities form a point of main effort in the programme. During 1988 the first tracer experiments with Br-82 and fluorescein were performed successfully at the Grimsel Test Site (GTS) and modelling of fracture zone hydraulics has been finished. Parallel to the field work, laboratory experiments on rock/water interaction, tracer sorption and tracer infiltration experiments into borecores from the migration zone have been performed together with modelling. Migration of heavy metals and its seasonal variation is investigated at the Glattfelden test site together with EAWAG and Berne University. As part of the ongoing developments to characterize colloids, a first workshop discussing the benchmark exercise with GTS waters was held at PSI in July. For biosphere transport different scenarios have been studied, mainly in the framework of the BIOMOVS study, and first use has been made of the SYVAC code system.

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UNITED STATES

RADIOACTIVE WASTE MANAGEMENT

PROGRAMS

IN 1988

Prepared for OECD/NEA

Radioactive Waste Management Committee Meeting

January 24, 1989

U.S. DEPARTMENT OF ENERGY

The status of U.S. Department of Energy (DOE) waste management programs managed by the Office of Civilian Radioactive Waste Management (OCRWM), the Office of Nuclear Energy (NE) and the Office of Defense Programs (DP) is as follows:

DISPOSAL OF SPENT NUCLEAR FUEL AND HIGH-LEVEL WASTE (OCRWM)

Amendments to the Nuclear Waste Policy Act (NWPA) Enacted

The Nuclear Waste Policy Amendments Act of 1987 (Amendments Act) redirected major elements of the U.S. program for disposing of spent nuclear fuel and high-level wastes. The significant requirements of the Amendments Act are:

The First Repository: The DOE Office of Civilian Radioactive Waste Management (OCRWM) is directed to characterize just one site, the Yucca Mountain site in Nevada, as a candidate for the first repository. The repository projects in salt and basalt are to be phased out.

The Second Repository: Activities with respect to siting a second repository are to be phased out. DOE is directed to report to the President and Congress between 2007-2010 on the need for a second repository.

Monitored Retrievable Storage (MRS): A special MRS Commission report is to be issued on the need for an MRS. The siting, construction and operation of one MRS facility is authorized subject to a number of conditions. Construction of an MRS facility may not begin until the Nuclear Regulatory Commission (NRC) has issued a license for the construction of a repository.

Financial Assistance: Provisions are specified for financial assistance to be paid to a State(s) hosting a repository or an MRS facility. Terms for specific fixed annual payments under a benefits agreement are established.

Activities to Implement the Amendments Act

Mission Plan Amendment: A draft document was issued in June 1988 and the final document is being prepared. Like the June 1987 version, the amended Mission Plan will summarize the current information available, the status of the program and strategies adopted to accomplish the overall objective of developing an integrated, safe, timely and efficient waste

management system with only Yucca Mountain in Nevada as the candidate site for the first repository.

Yucca Mountain Project: The Site Characterization Plan (SCP), which describes testing and analyses to be conducted at the Yucca Mountain site, was issued as a Consultation Draft to the State of Nevada and the NRC on January 8, 1988. The completed SCP was submitted to the State of Nevada and the NRC on December 28, 1988. Surface-based site characterization using geologic, tectonic/seismologic and hydrologic investigations are continuing, as well as the modelling of the repository system for subsequent performance assessment.

The techniques to gather subsurface data during site characterization of the Yucca Mountain site are being developed in a series of prototype tests conducted in a region of welded tuff in G-Tunnel at the Nevada Test Site.

During detailed site characterization at the Yucca Mountain site, an exploratory shaft facility (ESF) for in-situ testing will be constructed. The ESF will consist of two exploratory shafts, a drift that connects the shafts, other drifts for access and exploration, and underground rooms for testing, as well as some associated surface facilities.

In waste package development, draft reports to the U.S. Congress were prepared on the use of lead (Pb) in waste packages. Evaluation of alternative waste package concepts and materials was started.

A Preliminary Performance Assessment Strategy Document has been undergoing review. The document will identify interfaces between testing, design, and performance assessments. The major focus of the document is on the completion of assessments for technical position papers, issue resolution reports and the Safety Analysis Report for the Yucca Mountain Site.

Alternative Sites for the First Repository: Activities associated with site-specific work at the Hanford (Washington) basalt site and the Deaf Smith County (Texas) salt site have been terminated in conformance with the Amendments Act. The remaining activities are the decommissioning and reclamation of the boreholes, facilities, equipment, and excavations.

Second Repository: Activities leading to siting of a second repository were phased out in the spring of 1988. Future activities are precluded unless funds are specifically authorized and appropriated by Congress.

Monitored Retrievable Storage (MRS): The MRS Review Commission, consisting of three members appointed by Congress, is currently holding hearings. The Commission is to report to Congress by November 1989 on the need for an MRS facility. In October 1988, the Commission visited a number of European organizations to gather information for their study.

The MRS Commission must prepare a report to Congress on the need for an MRS facility as part of the civilian nuclear waste management system. After the MRS Commission has submitted its report to Congress, the Secretary may conduct a survey and an evaluation of potentially suitable sites for a monitored retrievable storage facility. An MRS siting alternative involves location of an MRS site through the efforts of a Nuclear Waste Negotiator appointed by the President.

Nuclear Waste Negotiator: The Amendments Act directs the President to appoint a Negotiator to seek a State or Indian Tribe willing to host a permanent repository or MRS facility at a suitable site, and to negotiate the terms and conditions for the facility. As of this time, the Negotiator has not been appointed.

Nuclear Waste Technical Review Board: In accordance with the Amendments Act, the President is to appoint an 11-person Nuclear Waste Technical Review Board. Appointments to the Board are pending Presidential selection. The Board is to review the technical aspects of the DOE's nuclear waste program, and is authorized to make recommendations to Congress.

Dry Cask Storage Study: In accordance with the Amendments Act, DOE is preparing a report on the use of dry cask storage at reactor sites until the repository begins operation. A draft of the report was issued for comment in August 1988, and the final report will be submitted to Congress in early 1989. The report considers the effects that several different types of at-reactor spent nuclear fuel storage technologies, including dry cask storage, may have on waste management system costs.

Benefits Agreement: A State or an Indian Tribe that agrees to host an MRS facility or the repository is eligible for a benefits agreement under the Amendments Act. Under the benefits agreement, an annual payment of $5 million for an MRS site and $10 million for a repository site would be provided prior to the receipt of the spent nuclear fuel. Subsequently, the annual payment is increased to $10 million and $20 million, respectively. The State or Indian Tribe in signing such an agreement must waive its right to disapprove the recommendations of a site for a repository and its right

to impact assistance but may participate in the design of facilities and the preparation of documents required by law on the effects to public health and safety.

Licensing Support System: An extensive electronic information management system is being developed to contain material from the license applicant (DOE), its contractors, potential parties, interested governmental participants and parties to the high-level radioactive waste licensing proceeding. Conceptual design of the system has been completed.

Reorganization of OCRWM: The Office of Civilian Radioactive Waste Management, which manages DOE's civilian spent nuclear fuel/high-level waste program, was reorganized along functional lines to replace the former multiple project lines. The major functional organizations are: Office of Quality Assurance; Office of Program Administration and Resources Management; Office of Facilities Siting and Development; Office of Systems Integration and Regulation; and Office of External Relations and Policy. Mr. S. Rousso has replaced Mr. C.E. Kay as Acting Director of OCRWM.

Management and Operating Contractor: The contract conditions for the solicitation of a management and operating contractor for the waste management system were revised in response to the Amendments Act. Bechtel Systems Management, Inc. was selected in December 1988 for award of a contract to provide overall systems engineering, development and management services. Bechtel Systems will oversee, coordinate and integrate the work of the following companies: Westinghouse Electric; Battelle Memorial Institute; Science Applications International Corp.; Parsons Brickerhoff, Quade and Douglas; Dames and Moore; Shannon and Wilson; and Los Alamos Technical Associates. Expenditures are estimated to average approximately $100 million annually over the ten-year contract period. Responsibilities in support of OCRWM's goals will encompass: overall waste management system design and analysis, site characterization, regulatory and licensing support, repository and waste package facility design, assistance in managing transportation, and siting, design and licensing services for a monitored retrievable storage facility as required.

INTERIM STORAGE AND TRANSPORTATION OF SPENT NUCLEAR FUEL (OCRWM)

Dry Storage of Spent Nuclear Fuel

A licensed dry storage facility using metal casks has performed satisfactorly at the Virginia Power's Surry nuclear power plant since 1986. At the Carolina Power and Light's H.B. Robinson plant, modular concrete vaults for dry storage will be demonstrated by loading three modules in 1989. At Duke Power's

Oconee plant, there are plans to install 10 vault modules with 24 intact pressurized water reactor fuel assemblies per module. Baltimore Gas and Electric Company has announced its intention to install a similar vault system at the Calvert Cliffs plant.

Status of Projects in Rod Consolidation for 1988 (OCRWM)

Rod consolidation investigations continued at the Idaho National Engineering Laboratory (INEL). The objective was to demonstrate consolidation in a dry environment, with the equipment in a horizontal position. Investigations were completed in March 1988 after 48 PWR assemblies had been consolidated into 24 canisters. Over 9000 rods were pulled without rod failure or breakage. The final report for this was issued in April 1988.

A follow-on project entitled the Prototypical Spent Fuel Consolidation Equipment Demonstration Project (PCDP) will involve a production scale demonstration with a throughput of 750 MTU/year. This project has advanced to Phase III (equipment manufacture and cold demonstration).

Transportation of Spent Fuel and High-Level Waste

DOE's transportation program is based on the recognition that full-scale movement of high-level waste and spent nuclear fuel will not start until 2003, given the present configuration of the waste disposal system. This gives ample time for developing detailed operating procedures to ensure compliance with regulations, and to develop the tangible elements of the Transportation program - such as shipping casks, vehicles, and support facilities.

Contracts have been awarded for design and development of two legal weight truck casks and three rail/barge casks for transporting spent nuclear fuel from nuclear power plants. These contracts include an option to have overweight truck casks designed and developed for spent nuclear fuel transport. The cask contracts require the contractors to have their designs approved by the U.S. Nuclear Regulatory Commission (U.S. NRC) and to provide the Department of Energy with up to two prototypes of each design. Technical issues (e.g. burnup credit) will be addressed by studies at Sandia National Laboratories.

The schedule allows DOE the opportunity to work with States, Indian Tribes and local governments toward the development of coordinated shipping procedures. Issues of special interest include routing, shipment inspection, and emergency response.

An application submitted to the NRC for certification of two dual-purpose casks is pending. The casks could be used for both rail transportation and storage. These casks will be used in a dual-purpose demonstration that includes shipment of spent fuel from West Valley, New York, from both boiling water and pressurized water reactors, for long-term dry storage in the same cask at the Idaho National Engineering Laboratory (INEL).

QUALITY ASSURANCE (QA) (OCRWM)

OCRWM is committed to having a fully qualified QA program in place and accepted by the NRC prior to start of the exploratory shaft at Nevada in 1989. To meet this commitment, existing QA Program Description documents have been consolidated into the OCRWM QA Requirements and QA Program Description documents and submitted to the NRC for acceptance. Supplemental quality assurance program documents (administrative and technical implementing procedures) and program participants' quality assurance plans are currently under development. Required program-wide indoctrination and training of all staff have been initiated. Surveillances and audits have begun throughout the program to verify that the program is functioning according to program requirements and plans. Throughout this process, DOE has been actively engaged in prelicensing consultations with the NRC to identify and resolve outstanding quality assurance issues.

PLANNED PROGRAM SCHEDULE (OCRWM, Calendar Years):

1989	Start Exploratory Shaft Facility at Yucca Mountain
1992	Identify Candidate MRS Facility Sites
1993	Issue draft Environmental Impact Statement for Yucca Mountain
1994	Issue final Environmental Impact Statement for Yucca Mountain
1994	Submit Site Recommendation Report for Yucca Mountain to the President
1994	Select Site for an MRS Facility
1995	Submit Repository License Application to the NRC
1995	Submit MRS Construction License Application to the NRC
1998	Start Construction of Repository
1998	Start Construction of MRS Facility
2003	Start Phase 1 Operations at Repository
2003	Begin Operations at MRS Facility

INTERNATIONAL ACTIVITIES (OCRWM, DP)

The Amendments Act focused the U.S. program on the characterization of the Yucca Mountain site and required DOE to terminate all research activities designed to evaluate the suitability of crystalline rock as a potential repository host medium. As a result, DOE conducted a comprehensive review of all its international waste management activities to ensure compliance with the Amendments Act and to phase out those activities no longer relevant to the OCRWM program. After review of OCRWM international activities, OCRWM took the following actions:

- DOE is continuing participation in the Stripa Project (Sweden) as a project directed to have applicability to a broad range of rock types.

- A project agreement between DOE and the National Cooperative for the Disposal of Radioactive Waste (NAGRA in Switzerland) was modified and cooperation is continuing in support of the Yucca Mountain Project.

- The bilateral agreement between DOE and the Swedish Nuclear Fuel and Waste Management Company (SKB) was modified and cooperation is continuing in support of the Yucca Mountain Project.

- A project agreement between the U.S. and Canadian AECL focusing on the Canadian Underground Research Laboratory was set aside. Discussions with AECL are continuing on a replacement agreement in areas of technology supporting the needs of the Yucca Mountain Project.

- Active bilateral agreements on waste management are continuing with Belgium, France, and Japan.

- U.S. participation in NEA and IAEA waste management activities is continuing.

- Site-specific, non-generic cooperative activities with the Federal Republic of Germany investigating salt as a potential repository medium have been phased out and the liaison representative to FRG reassigned. The OCRWM and the FRG will, however, continue to exchange technical information in such areas as storage and transportation systems development. The cooperation between the Office of Defense Programs and FR Germany concerning the Waste Isolation Pilot Plant (WIPP) in salt will continue.

DISPOSAL OF GOVERNMENT TRANSURANIC WASTE (DP)

Status of WIPP: The Waste Isolation Pilot Plant (WIPP) located near Carlsbad, New Mexico is projected to begin receiving DOE transuranic waste in 1989, beginning a five-year demonstration phase. Construction necessary for initial waste receipt is essentially complete. The first of eight storage panels is fully mined. Each panel will have seven rooms measuring 13 feet high, 33 feet wide and 300 feet long. A fourth shaft (necessary for simultaneous mining and waste emplacement) and the emergency services building will be completed in early 1989.

The demonstration phase will begin as soon as all safety-related appraisals are complete and environmental and land-withdrawal requirements are met. These requirements are anticipated to be satisfied by September 1989. A test to resolve uncertainties related to brine accumulation and seepage is included in the evaluation program.

DISPOSAL OF GOVERNMENT MIXED WASTE (DP)

The Department of Energy (DP) plans to have two mixed waste disposal facilities on-line by 1990. One will be at the Savannah River Plant (SRP) near Aiken, South Carolina, and the other will be located on the Nevada Test Site (NTS) about 70 miles north of Las Vegas, Nevada.

The SRP intends to meet treatment standards for mixed low-level waste (LLW) prior to disposing of them in an above-ground facility designed to handle the 2,000 cubic meters of mixed waste now accumulating in storage and 400 cubic meters per year of newly generated waste.

The existing NTS LLW facility will opened to mixed wastes when permitting requirements are met. It is a shallow land burial facility with the groundwater table located approximately 800 feet below the surface and in an area with very low rainfall.

DISPOSAL OF CIVILIAN LOW LEVEL WASTE (NE)

Currently, 39 States are grouped into nine regional compacts that are organized for the disposal of low-level waste. Four States have announced plans to develop their own disposal sites. Most of the States and regional compacts met the January 1, 1988, deadline for completion of plans for siting and for developing disposal facilities required by the Low-Level Radioactive Waste Policy Amendments Act of 1985. These States and regional

compacts are now implementing the plans, selecting candidate disposal sites, and evaluating alternative disposal technologies. The rest of the States are as yet unaffiliated and are not implementing siting plans.

CONDITIONING OF CIVILIAN AND GOVERNMENT HIGH-LEVEL WASTE (DP AND NE)

Programs leading to the immobilization of high-level liquid waste are continuing at Savannah River, West Valley, Hanford, and Idaho. The Defense Waste Processing Facility (DWPF) at Savannah River will begin operations in 1990 on the highly radioactive fraction of its high-level waste, producing borosilicate glass for permanent disposal in a Federal geologic repository. Development programs continue on the vitrification process intended for Hanford. Preliminary design of the Hanford Waste Vitrification Plant (HWVP) has been initiated. Startup is scheduled for the late 1990s. A process and associated waste form for immobilization of calcined high-level waste are being developed at the Idaho Chemical Processing Plant.

At the West Valley facility, liquid high-level waste will be pretreated and its volume will be reduced by separating the bulk of chemical salts from radioactive contents in the Supernatant Treatment System. Non-radioactive testing of the Supernatant Treatment System was completed in 1988. Startup of the vitrification system for the resultant high-level waste fraction is scheduled for 1990.

CONDITIONING OF GOVERNMENT TRANSURANIC WASTE (DP)

All Federal sites generating transuranic waste are continuing to certify waste to meet the waste acceptance criteria of the Waste Isolation Pilot Plant (WIPP). At INEL, the Stored Waste Examination Pilot Plant (SWEPP) is operational, providing capabilities for visual and radiographic examination, determination of fissile inventory, weighing, radiological survey, repackaging, etc. Also at INEL, construction of the Process Experimental Pilot Plant (PREPP) has been completed. The PREPP provides capabilities for shredding, incinerating, and fixing in cement transuranic waste that does not currently meet the WIPP waste acceptance criteria.

CONDITIONING OF CIVILIAN AND GOVERNMENT LOW-LEVEL WASTE (NE & DP)

Because of the high surcharge on disposal of civilian low-level waste (LLW) introduced by the 1985 amendments to the Low-Level Radioactive Waste Policy Act and due to programs to reduce LLW generation, the volume of commercially-generated waste transported to LLW disposal sites continues to decrease. Both volume reduction, mainly by supercompaction and waste sorting, and longer onsite storage are contributing to the decrease in waste shipments. In 1987, utilities and private-sector industries in the U.S. disposed of about 1.8 million cubic feet of LLW.

Similar improvements are being introduced at Federal sites. A supercompactor was installed for volume reduction of low-level waste and began operation at West Valley in early 1988. A contact-handled waste Size Reduction Facility also began operation in early 1988.

WASTE VOLUME REDUCTION PROGRAM (DP)

Recent environmental and health legislation and a new DOE Order emphasize reduced generation of wastes and reduced toxicity in waste at DOE facilities. The Resource Conservation and Recovery Act (RCRA) requires that the volume and toxicity of hazardous waste requiring land disposal be minimized to the extent practicable. DOE order 5820.2A states that radioactive and mixed waste shall be managed to minimize the generation of such waste and to comply with all environmental, safety and health laws and regulations, and DOE requirements. In addition to laws and regulations, there are other incentives for avoiding the generation of waste, including savings because of rising disposal costs, restrictions on use of land for disposal, avoiding possible future liabilities, and attending to proper stewardship of the environment.

The waste minimization policy, formalized for DOE Defense Programs in October 1988, is the first measure taken within DOE to avoid as far as practicable, the generation of low-level, high level, transuranic, hazardous, and mixed wastes, and to reduce the toxicity of waste streams containing hazardous components. Second, where waste is unavoidably generated, recycle or reuse of all or part of the waste stream components will be attempted. Finally, non-reusable waste will be treated to the extent practicable to further reduce toxicity or volume.

REMEDIAL ACTION (DP & NE)

Environmental Restoration at DOE Sites(DP)

Projects to assess and clean up radioactive and mixed hazardous and radioactively contaminated soil areas, surface water body sediments, and groundwater are being planned and undertaken at operating U.S. DOE sites that support production of defense nuclear materials. These projects are under way at the Rocky Flats Plant in Colorado, the Feed Materials Production Center in Ohio, the Savannah River Plant in South Carolina, the Hanford Plant in Washington, the Oak Ridge National Laboratory (ORNL) in Tennessee, and at other facilities.

Projects to maintain, decontaminate and decommission buildings and structures formerly used in support of defense programs are being undertaken at several DOE sites -- Hanford, ORNL, INEL, Mound Laboratory in Ohio, and others. A draft Environmental Impact Statement for the project to decommission eight Hanford production reactors will be issued in 1989.

It has been estimated recently that excavation of contaminated soils and building rubble from 18 defense sites in 12 states could create up to 1.4 million cubic feet of LLW by 2002.

Decommissioning Activities(NE)

Projects to characterize and clean up radioactively contaminated buildings, structures, and soil are being planned and implemented at both U.S. DOE and privately owned facilities that supported civilian nuclear power research and development. Projects are under way at the Santa Susana Field Laboratory in California, the Hanford Plant in Washington, the Idaho National Engineering Laboratory, the Los Alamos National Laboratories in New Mexico, the Argonne National Laboratory in Illinois, the Mound Laboratory in Ohio, the Oak Ridge National Laboratory in Tennessee, and a uranium mill site in Monticello, Utah.

Status of the Shippingport Decommissioning Project(NE)

The Shippingport Station Decommissioning Project is continuing on schedule and within cost and is approximately 80 percent complete. Demolition of the major buildings to 3 feet below grade is nearly complete and the foundations are being backfilled with non-contaminated rubble and soil.

On December 14, 1988, the reactor pressure vessel/neutron shield tank (RPV/NST) assembly was lifted out of containment and placed on a transporter for storage pending loading on a barge early in the spring of 1989. Once on the barge, the RPV/NST assembly will be shipped for burial at the Hanford Reservation in Washington State during 1989.

Both RPV and the NST are filled with cement grout both for shielding and for structural stability of the waste package such that the RPV/NST becomes its own shipping and burial container. The RPV/NST assembly is being certified by the U.S. DOE as a Type B package which meets both NRC and IAEA requirements.

The size (41 feet long x 18 feet in diameter) and weight (1,940,000 pounds) of the RPV/NST assembly are very similar to the size and weight of full-scale PWR and BWR reactor pressure vessels. Thus, the experience gained at Shippingport on removal of the RPV/NST assembly is directly applicable to commercial reactor plants choosing one-piece RPV removal for decommissioning.

Formerly Utilized Sites Remedial Action Project (NE)

Twenty-nine sites are currently scheduled for clean up. The comprehensive site search and screening process of other potential sites to be included in the projects was completed in 1988. Additional sites may be added as a result of the screening process.

The Grand Junction Remedial Action Project included approximately 600 structures. The project was completed in 1988.

The Uranium Mill Tailings Remedial Action Project includes 24 inactive uranium milling sites and several thousand associated vicinity properties. In 1988, remedial action was completed on approximately 890 vicinity properties. Engineering and planning documentation is under way for stabilization of all other sites. The DOE has proposed an extension from 1990 to 1994 of DOE's authority to conduct remedial action at mill tailing sites.

PRICE-ANDERSON AMENDMENTS ACT OF 1988 (PAAA)

The PAAA renews, until August 1, 2002, and makes mandatory, the Department of Energy's authority to provide liability protection to its nuclear contractors and the public for damages that could arise during DOE-contractor nuclear activities. Therefore, all DOE nuclear waste activities carried out by contract must be covered by the Price-Anderson system, including transportation and waste disposal. The PAAA raised the statutory limitation of liability for a nuclear incident to approximately $7 billion as compared to a previous $720 million for NRC licensees and $500 million for DOE contractors. Funds would come

from Government funds, or in the case of activities under the Nuclear Waste Policy Act as amended, from the Nuclear Waste Fund collected from utilities operating nuclear power plants.

ACTIVITIES OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

The Environmental Protection Agency (EPA) is continuing its program for developing generally applicable environmental radiation standards for the land disposal of low-level radioactive waste through its Office of Radiation Programs. The elements of the standards include:

- exposure limits for pre-disposal management and storage operations
- criteria for wastes that are Below Regulatory Concern (BRC)
- post-disposal exposure limits
- groundwater protection requirements
- qualitative implementation requirements.

In addition to covering those radioactive wastes as defined by the Atomic Energy Act, the EPA also intends to propose a standard to require the disposal of specific high concentration, relatively low volume Naturally Occurring and Accelerator-Produced Radioactive Material (NARM) wastes exceeding 2nCi/g, excluding a few consumer items, in regulated LLW disposal facilities. The proposed standards are expected to be published in 1989, for public review and comments.

The EPA is continuing its program to develop radiation protection criteria for cleanup of land and facilities contaminated with residual radioactive materials.

In September 1987, groundwater standards were proposed for inactive uranium processing mill sites to supplement the existing standards under 40 CFR 192. These standards are expected to be finalized in 1989.

EPA's environmental standards for the management and disposal of spent nuclear fuel, high-level, and transuranic wastes, were remanded to EPA in 1987 by the U.S. Court of Appeals for the First Circuit. In 1988, EPA initiated a program to re-promulgate those standards. The rulemaking will concentrate on the issues raised by the Court in its remand, and public comment on all aspects of the disposal standards will be considered. The Agency plans to publish standards again for public review and comment by the end of 1989.

ACTIVITIES OF THE NUCLEAR REGULATORY COMMISSION (NRC)

Negotiated Rulemaking - High-Level Waste

In November 1988, NRC issued for comment a proposed rulemaking on the adjudicatory proceeding for licensing a high-level waste repository. A negotiated rulemaking process was used to develop the rule, drawing on the contributions of the affected parties as a group to develop consensus on the proposed rule. Parties to the negotiation were DOE, NRC, the State of Nevada, Nevada local coalition of national environmental groups, industrial groups and the National Council for American Indians. This rule is to establish the basic procedures for the repository licensing proceeding, including the use of the Licensing Support System, an electronic information management system.

Other Regulatory Development Activities

The staff continues to refine regulatory requirements, to improve the effectiveness of the licensing process for NRC reviewers, adjudicatory boards, and DOE. Consequently, three rulemaking actions continued during fiscal year 1988. First, proposed amendments to Part 61 were published requiring disposal of "greater-than-Class-C" (GTCC) wastes in a HLW repository if no other suitable disposal facility is available. This rule would alleviate the need to classify some of the GTCC wastes as HLW and some as non-HLW. Second, NRC published proposed amendments to Parts 51 and 60, specifying the conditions for NRC adoption of DOE's repository environmental impact statement. These proposed amendments specify that the NRC will adopt DOE's EIS to the extent practicable, unless substantive new information or new considerations have arisen and have not been addressed by DOE in a supplemental EIS. This will complete all the rulemakings required for conformance with NWPA.

Regulatory Guidance Activities

NRC's regulatory guidance for high-level waste is directed mainly at reducing areas of high technical uncertainty; i.e., areas where standard testing or analysis methods are not available or where existing methods are controversial. The staffs' regulatory guidance is provided in Technical Positions (TPs) which contain criteria for acceptable methods of demonstrating compliance with 10 CFR Part 60.

The following TPs were published in final form or for public comment during fiscal year 1988:

- Final TP - "Items and Activities in the High-Level Waste Geologic Repository Program Subject to 10 CFR Part 60 Quality Assurance Requirements" (NUREG-1318)

- Public Comment Draft TP - "Post-Closure Seals in an Unsaturated Media"

- Public Comment Draft TP - "Guidance for Determination of Anticipated Processes and Events"

Further, the staff managed the development of contractor documents (NUREG/CRs) that will support future TPs in the areas of geochemistry, geology/geophysics, hydrology, performance assessment, quality assurance, geotechnical engineering/design, and waste package engineering.

License Application and Site Characterization Review Activities

NRC's prelicense application review and consultation process is a major mechanism for giving guidance to DOE before submittal of the repository license application. This guidance process is intended to identify and resolve staff concerns with DOE's program that could become licensing issues if not resolved.

As previously mentioned, DOE issued the Comment Draft of the Site Characterizaton Plan (CDSCP) for the Yucca Mountain Nevada Site in January 1988. In March 1988, NRC released draft point papers on the staff's preliminary concerns, and in May 1988, the staff issued its final point papers. In these, NRC identified five objections to DOE starting work. These were in the areas of identification of alternative conceptual models; establishment of a qualified quality assurance (QA) program; and potentially adverse impacts of the exploratory shaft facility on waste isolation and other site characterization activities.

Quality Assurance Activities

The CDSCP gave the NRC staff its first opportunity to provide comprehensive comments on the DOE QA program. Other significant staff activities include the resolution of numerous QA open items, review of the Yucca Mountain Project Office QA Plan, and observation audits to evaluate the implementation of DOE's QA program.

The staff review of the CDSCP determined that the staff had an insufficient basis for confidence in the DOE QA program and that the data collected under the existing program was of

questionable use for licensing. Furthermore, it was agreed that DOE would start no new work until the NRC staff had more confidence in the DOE QA program.

Center for Nuclear Waste Regulatory Analysis

In October 1987, the NRC executed a contract with Southwest Research Institute in San Antonio, Texas, which established the Center for Nuclear Waste Regulatory Analysis (CNWRA), a Federally-funded research and development center. After a phase-in period, the CNWRA will be the sole contractor providing technical assistance and research support to the NRC.

The CNWRA completed its first year of operation on October 14, 1988. In accordance with the NRC's three year "phase-in" plan, in Year 1 the startup and planning activities of the CNWRA were emphasized. In addition to the physical aspects of implementing the CNWRA, an organizational structure--including management and control techniques--was established. The CNWRA began to develop its technical and analytical capability; initiated four research projects, as well as a three-year transportation risk study; and began to develop the "Program Architecture." The Program Architecture is a systematic analysis of the entire high-level waste management system, including at-reactor storage, any interim storage, such as monitored retrievable storage, defense and commercial high-level waste programs, and transportation, as well as the repository. It covers the entire life cycle of the regulatory program, from pre-license application through construction, operation and closure.

NRC's Advisory Committee on Nuclear Waste

The Nuclear Regulatory Commission has established an Advisory Committee on Nuclear Waste. This Committee will provide advice to the NRC on issues and activities related to the regulation of nuclear waste management. DOE is cooperating with this Committee in providing full information on its licensing-related plans, activities, and results.

UPCOMING WASTE MANAGEMENT MEETINGS IN THE U.S.

February 26- March 2, 1989	Tucson, Arizona: Waste Management '89. Contact: Morton Wacks, University of Arizona, Tucson, Arizona 85721 Tel: (602)621-2475.
April 2-5, 1989	Las Vegas, Nevada: Third Annual Waste Management Quality Assurance Conference. Contact: Dale Hedges, P.O. Box 15090, Las Vegas, Nevada 89114-5090 Tel: (702)735-7136.
April 2-5, 1989	Orlando, Florida: Fuel Cycle Conference. Contact: U.S. Council for Energy Awareness, 1776 I Street, NW, Suite 400, Washington, DC 20006-2494 Tel: (202)293-0770.
April 2-7, 1989	Pittsburgh, Pennsylvania: ANS International Topical Meeting on Probability, Reliability and Safety Assessment. Contact: David Squarer Westinghouse R&D Center, 1310 Beulah Road, Pittsburgh, Pennsylvania 15235.
May 1-5, 1989	Knoxville, Tennessee: 8th International Conference on Incineration of Hazardous/Radioactive Wastes. Contact: Charlotte Baker, University of California, Irvine, California 92717 Tel: (714)856-7066.
June 4-8, 1989	Atlanta, Georgia: ANS Annual Meeting of the American Nuclear Society. Contact: ANS Meetings, 555 N. Kensington Ave., La Grange Park, IL 60525 Tel: (312)352-6611.
June 11-16, 1989	Washington, DC: PATRAM '89 (9th International Symposium on the Packaging and Transportation of Radioactive Materials). Contact: Lawrence Harmon, U.S. Dept. of Energy, Washington, DC 20545 Tel: (301)353-3506.
September 18-21, 1989	Las Vegas, Nevada: FOCUS '89, Nuclear Waste Isolation in the Unsaturated Zone. Contact: D. Burton Slemmons, Univ. of Nevada-Reno, School of Mines, LME 400, Reno, Nevada 89557-0047 Tel: (702)784-6067.

November 26- December 1, 1989	San Francisco, California: ANS Winter Meeting. Contact: ANS Meetings Dept., 555 N. Kensington Ave., La Grange Park, Illinois 60525 Tel: (312)352-6611.

MAJOR OCRW DOCUMENTS ISSUED MARCH 1988-DECEMBER 1988

DOE (US Department of Energy), June 1988. Draft 1988 Mission Plan Amendment, DOE-RW-0187, Washington, D.C.

DOE (US Department of Energy), June 1988. Annual Capacity Report, DOE-RW-0191, Washington, D.C.

DOE (US Department of Energy), August 1988. Initial Version Dry Cask Storage Study, DOE-RW-0196, Washington, D.C.

DOE (US Department of Energy), August 1988. Annual Report to Congress, DOE-RW-0189, Washington, D.C.

DOE (US Department of Energy), December 1988. Site Characterization Plan, DOE-RW-0199, Washington, D.C.

DOE (US Department of Energy), December 1988. Section 175 Report, DOE-RW-0205, Washington, D.C.

DOE (US Department of Energy), December 1988. Environmental Program Overview, YMP/99-23, Washington, D.C.

DOE (US Department of Energy), December 1988. Environmental Monitoring and Mitigation Plan, DOE-RW-0176, Washington, D.C.

DOE (US Department of Energy), December 1988. Environmental Regulatory Compliance Plan, DOE-RW-0177, Washington, D.C.

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