

Nuclear waste

B U L L E T I N

sur les déchets nucléaires

Update on Waste Management Policies and Programmes

Mise à jour des politiques et des programmes
de la gestion des déchets

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NUCLEAR ENERGY AGENCY
AGENCE POUR L'ENERGIE NUCLEAIRE

THE OECD NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established in 1957 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20 April 1972 when Japan became its first non-European full Member. The 23 NEA Member countries include all European Member countries of the OECD, as well as Australia, Canada, Japan, and the United States. The Commission of the European Communities takes part in the NEA's work and a co-operation agreement has been concluded with the International Atomic Energy Agency.

The general aim of the NEA is to further the development of the peaceful uses of nuclear energy by sponsoring economic, technical, and scientific studies and projects, and by increasing the compatibility of the safety and regulatory policies and practices of its Member countries.

L'AGENCE DE L'OCDE POUR L'ENERGIE NUCLEAIRE

L'Agence de l'OCDE pour l'énergie nucléaire (AEN) a été créée en 1957 sous le nom d'Agence Européenne pour l'Energie Nucléaire de l'OCDE. Elle a pris sa dénomination actuelle le 20 avril 1972 lorsque le Japon est devenu son premier pays Membre de plein exercice non-européen. Les 23 pays Membres de l'AEN comprennent tous les pays européens Membres de l'OCDE, ainsi que l'Australie, le Canada, les Etats-Unis, et le Japon. La Commission des Communautés Européennes participe à ses travaux et un accord de coopération a été conclu avec l'Agence Internationale de l'Énergie Atomique.

L'objet de l'Agence est de promouvoir le développement des utilisations pacifiques de l'énergie nucléaire grâce à des études et projets de caractère économique, technique et scientifique, et d'assurer une plus grande compatibilité des politiques et pratiques de sécurité et de réglementation de ses pays Membres.

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EDITOR'S NOTE

The NEA Nuclear Waste Bulletin has been prepared by the Division of Radiation Protection and Waste Management of the OECD Nuclear Energy Agency to provide a means of communication amongst the various technical and policy groups within the waste management community. In particular, it is intended to provide timely and concise information on radioactive waste management activities, policies, and programmes in Member countries and at the NEA. It is also intended that the Bulletin assists in the communication of recent developments in a variety of areas contributing to the development of acceptable technology for the management and disposal of nuclear waste (e.g., performance assessment, in situ investigations, repository engineering, scientific data bases, regulatory developments, etc.).

NOTE DE LA REDACTION

Le Bulletin de L'AEN sur les Déchets Nucléaires a été établi par la Division de la Protection Radiologique et de la Gestion des Déchets Radioactifs de l'Agence pour L'Energie Nucléaire en vue de faciliter la communication entre les différentes communautés intéressées par les aspects techniques et politiques de la gestion des déchets radioactifs. Son objectif est notamment de passer brièvement en revue les questions d'actualité, les politiques, et les programmes en matière de gestion des déchets radioactifs dans les pays Membres et à l'AEN. La publication du Bulletin devrait faciliter la dissémination d'informations sur les événements récents dans les différents domaines contribuant à la mise au point de techniques acceptables pour la gestion et l'évacuation des déchets radioactifs (évaluation des performances, recherches in situ, ingénierie des dépôts, bases de données scientifiques, réglementation, etc.).

NATIONAL PROGRAMMES AND POLICIES POLITIQUES ET PROGRAMMES NATIONAUX

AUSTRALIA

THE SYNROC R&D PROGRAMME

The multiphase crystalline ceramic-titanate waste form, Synroc, has been under development in Australia, mainly at the Australian Nuclear Science and Technology Organization (ANSTO), since 1979. The current phase of the Australian work will culminate at the end of 1991 with the production and costing of a conceptual design for a fully-active Synroc fabrication plant, together with the release of a comprehensive Synroc data base.

During the 1980s, collaborative R&D agreements covering Synroc were established between ANSTO and the UKAEA, the Japan Atomic Energy Research Institute (JAERI), and the Italian ENEA. During 1990, Memoranda of Understanding were also signed with organisations in the USSR and the Peoples Republic of China.

Another notable development during 1990 was extension of the ANSTO/JAERI Agreement on nuclear waste management R&D for a further five years. The first phase of this Agreement, for the period 1985-1990, covered ANSTO/JAERI collaboration in the development of Synroc as well as JAERI participation in the Alligators Rivers Project, an international repository analogue study centred in Australia (discussed in detail later in this issue of the Bulletin). The main topic of Synroc collaboration has been the effect of actinide decay-induced radiation damage on the long-term behaviour of this waste form. In the extension, radiation damage studies will continue at both organisations, but there will be more emphasis on designing and testing forms of Synroc for the specific role of immobilising partly or wholly partitioned transuranic actinides, i.e., TRU-rich waste. Some of this work will be done at JAERI in close association with related work under the OMEGA partitioning/transmutation programme, and some will be done at ANSTO as part of a continuing study of Synroc science and technology in Australia. It is anticipated that exchange of scientists between ANSTO and JAERI, which has been a feature of this collaboration so far, will continue through the second five years of the Agreement.

Further information can be obtained from A. Camilleri, ANSTO, Private Mail Bag 1, Menai, NSW 2234, Australia [Tel: 61 (2) 543 3111, Tlx: AA 24562, Fax: 61 (2) 543 5097].

BELGIUM

In Belgium there is a distinction between low-level wastes, containing essentially short-lived radionuclides (category A wastes) and intermediate- and high-level wastes, containing

long-lived and/or heat-producing radionuclides (category B and C wastes). Currently, two options are envisaged for the disposal of category A wastes: either at the surface in specially engineered facilities at geologically favourable sites, or at depth in repositories similar to those foreseen for category B and C wastes.

SELECTION OF ZONES SUITABLE FOR LOW-LEVEL WASTE DISPOSAL

The site-selection work carried out to date has been aimed at identifying geologically favourable regions to conduct detailed characterisation of the geological and hydrogeological parameters. This work relies on the available reference material, which constitutes the basis for a decision on continuation of this work, in particular, for studies leading to the acquisition of a certain number of complementary background data (geology, topography, hydrogeology) in the selected zones. Collecting data will allow sensitivity studies to be made for the different zones using mathematical models of migration in the geosphere. It will then be possible to evaluate if disposal of low-level wastes at, or near, the surface is feasible in Belgium and, if so, under what conditions.

SITE SELECTION AND DESIGN OF EXPERIMENTS FOR DEEP DISPOSAL

The disposal of category B and C wastes in deep argillaceous layers is currently the reference option in Belgium. This option has been the object of a significant multidisciplinary research programme carried out by CEN/SCK (the Centre of Nuclear Energy Studies, at Mol) since 1975, supported in part by the Ministry of Economic Affairs, the competent authority for energy matters in Belgium, and in part by the Commission of the European Communities (CEC) in Brussels. Conforming to the conclusions of the SAFIR Commission, given at the beginning of 1990 (see Bulletin No. 5), problems associated with site selection and the design of experiments should constitute a significant part of the R&D programme to be conducted in the coming years in Belgium. Results from this programme will enable a Preliminary Safety Assessment Report (PSAR) to be presented to the national authorities in 1997.

Earth science research and site survey work have already been identified and can be summarised as follows:

- inventory and synthesis of geological surveys carried out in the Mol-Dessel area over the last fifteen years and identification of local zones for subsequent investigation,
- complementary surveys, preferably by the completion of high-resolution seismic profiles, in and around the region of the Mol-Dessel site, with the aim of identifying faults, folds and other tectonic features affecting the Boom clay layer,
- detailed lithological characterisation of the Boom clay layer by means of borehole coring and logging, with the aims of identifying possible heterogeneities in the formation and defining the upper and lower transition layers,
- synthesis of existing hydrogeological data and models and evaluation of their applicability with respect to future safety studies, and

- establishment of an extensive hydrogeological programme of data collection and of regional and local flow modelling.

Research areas related to the design of experiments for disposal in clay, as well as safety aspects and repository design, constitute the principal lines of investigation carried out in the framework of the underground laboratory constructed in clay beneath the CEN/SCK site. The current five-year plan includes an experiment, currently under design, consisting of heated canisters placed under the same conditions as those expected in the final repository. The aim is to simulate interaction between heat-producing vitrified wastes and the surrounding clay (PARCLAY experiment). This will allow the integration of thermo-hydro-mechanical, backfilling, and structural stability aspects in the form of a demonstration. The demonstration should begin in 1992 and run for several years, during which time measurements will be intensively collected in the clay.

Further information on the above items can be obtained from P. Manfroy, ONDRAF/NIRAS, Place Madou 1, Boîtes 24/25, B-1030 Brussels, Belgium [Tel: 32 (2) 212 10 43, Tlx: 65784 NIROND, Fax: 32 (2) 218 51 65].

BELGIQUE

En matière d'évacuation des déchets radioactifs, la Belgique fait la distinction entre les déchets de faible activité, contenant essentiellement des radionuclides de courtes demie-vies (déchets de catégorie A) et les déchets moyennement et hautement radioactifs, contenant des radionuclides de longues demie-vies et/ou producteurs de chaleur (déchets de catégories B et C). A l'heure actuelle deux options sont envisagées pour l'évacuation des déchets de catégorie A: soit en surface dans des installations spéciales prioritairement aménagées sur un site géologiquement favorable, soit en profondeur dans des infrastructures semblables à celles prévues pour les déchets de catégories B et C.

SÉLECTION DE ZONES PROPICES À L'ÉVACUATION DES DÉCHETS DE FAIBLE ACTIVITÉ

Les travaux de sélection effectués jusqu'à présent ont pour but d'identifier les régions géologiquement favorables au sein desquelles des reconnaissances de terrains ultérieures pourront être entreprises en vue de caractériser les paramètres géologiques et hydrogéologiques de manière approfondie. Les études actuelles fondées sur le matériel bibliographique actuellement disponible, constituent une base d'évaluation pour la suite à donner aux travaux en cours et plus particulièrement pour les travaux conduisant à l'acquisition d'un certain nombre de données complémentaires de base (géologie, topographie, hydrogéologie) dans les zones sélectionnées. Les données ainsi rassemblées permettront, au moyen des modèles mathématiques disponibles de migration dans la géosphère, d'effectuer des études de sensibilité pour les différentes zones sélectionnées. Il sera alors possible d'évaluer si une évacuation en surface ou à faible profondeur de déchets de faible activité est envisageable en Belgique et si oui à quelles conditions.

SÉLECTION DE SITES ET CONCEPTION D'EXPÉRIENCES POUR L'ENFOUISSEMENT PROFOND

L'enfouissement des déchets de catégories B et C en couche argileuse profonde constitue jusqu'à présent l'option de référence en Belgique. Cette option a fait l'objet d'un important programme de recherches multidisciplinaires entrepris par le CEN/SCK (Centre d'Etudes de l'Energie Nucléaire de Mol) dès 1975 et subventionné pour partie par le Ministère des Affaires Economiques qui est, en Belgique, compétent en matière d'énergie et pour partie par la Commission des Communautés Européennes de Bruxelles (CCE). Conformément aux conclusions de la Commission SAFIR (voir Bulletin No. 5), déposées au début de 1990, les problèmes de sélection de sites et les conceptions d'expériences qui y sont associées constituent une partie importante des programmes de R&D qui seront poursuivis dans les prochaines années en Belgique et dont les résultats permettront de présenter aux Autorités Nationales à l'échéance de 1997 un document préliminaire de sûreté (PSAR pour Preliminary Safety Assessment Report).

Les domaines de recherche touchant aux sciences de la Terre et aux reconnaissances de sites ont été d'ores et déjà identifiés et peuvent se résumer comme suit:

- inventaire et synthèse des campagnes de reconnaissance géologique menées dans la région de Mol-Dessel depuis une quinzaine d'années et identification des zones locales à prospecter ultérieurement,
- reconnaissances complémentaires, de préférence par profils sismiques de haute résolution dans et autour de la région du site de Mol-Dessel, dans le but d'identifier les failles, flexures et autres accidents tectoniques affectant la couche d'argile de Boom,
- caractérisation lithologique fine de la couche d'argile de Boom par forages carottés et diagraphiés dans le but d'identifier les hétérogénéités éventuelles au sein de la formation et de définir les couches de transition supérieures et inférieures,
- synthèse des données et modèles hydrogéologiques existants et évaluation de leur applicabilité dans le cadre des études de sûreté futures, et
- établissement d'un programme hydrogéologique extensif d'acquisition de données et de modélisation des écoulements régionaux et locaux.

Les domaines de recherche touchant aux conceptions d'expérience sur l'enfouissement dans l'argile constituent, avec les aspects de sûreté et de concepts de dépôt, les sujets principaux d'investigation qui ont pour cadre le laboratoire souterrain creusé dans l'argile sous le site technique du CEN/SCK. Le présent plan quinquennal prévoit une expérience, actuellement en cours de conception, qui consistera à placer des charges chauffantes dans les mêmes conditions que celles du dépôt final et aura pour but de simuler les interactions entre les déchets vitrifiés producteurs de chaleur et le massif argileux (expérience PRACLAY). Ceci permettra d'intégrer les aspects thermo-hydro-mécaniques, de remblayage et de stabilité des structures sous la forme d'une petite démonstration qui devrait débuter dans le courant de 1992 et se prolonger pendant plusieurs années durant lesquelles une auscultation intensive du massif d'argile sera poursuivie.

Pour plus de renseignements prendre contact avec P. Manfroy, ONDRAF/NIRAS, Place Madou 1, Boîtes 24/25, B-1030 Bruxelles, Belgique [Tel: 32 (2) 212 10 43, Tlx: 65784 NIROND, Fax: 32 (2) 218 51 65].

CANADA

PROGRESS IN REVIEW OF HIGH-LEVEL WASTE DISPOSAL CONCEPT

The appointment and terms of reference of the Scientific Review Group (SRG) were announced in August 1990 by the Environmental Assessment Panel responsible for reviewing the proposed concept for the disposal of nuclear fuel waste. The SRG has fifteen members who are experts in the scientific and engineering disciplines employed in the Canadian Nuclear Fuel Waste Management Programme. R.A. Price of the Department of Geology, Queen's University, is the chairman of the Group. The SRG will advise the Panel on scientific and technical matters raised during the course of the review.

The Environmental Assessment Panel held scoping meetings in October and November 1990 in the provinces of New Brunswick, Quebec, Ontario, Saskatchewan, and Manitoba. The purpose was to identify issues, in order to help define the scope of the Environmental Impact Statement (EIS) that AECL is required to submit. The guidelines resulting from the scoping meetings will probably be issued in the middle of 1991, after which AECL will be allowed sufficient time to complete and submit the EIS. The Panel will then carry out a review of the EIS and issue a report on the acceptability of the concept and future steps to be taken for the management of nuclear fuel waste in Canada.

Further information can be obtained from H. Tamm, Whiteshell Laboratories, Pinawa, Manitoba, ROE 1LO, Canada [Tel: 1 (204) 753 2311, Tlx: 063671345, Fax: 1 (204) 753 2455].

CIGAR LAKE ANALOGUE STUDY

AECL Research has been conducting studies on the Cigar Lake uranium deposit in the Province of Saskatchewan since 1984. This unique deposit, the highest grade in the world, has many features which make it valuable as an analogue to study processes that could occur in nuclear fuel waste disposal vaults. The deposit is located at a depth of 430 m at the unconformity contact of the Athabasca Sandstone Formation and the basement rock. There are no direct radiological, thermal, geophysical, or geochemical indications at the surface that give evidence of the underlying ore deposit. Discovery was made from detailed knowledge of the ore genesis, combined with indirect geophysical observations. The uranium mineralisation consists primarily of uranite (UO_2) and uranium silicate (coffinite, USiO_4) formed about 1.3×10^9 years ago. The average grade of the ore is about 12 wt% uranium, with maximum localised concentrations in excess of 55 wt%. The ore body occurs as an irregularly shaped lens about 2000-m long, 25-to-100-m wide and 1-to-20-m deep. The ore reserve is estimated to be 1.5×10^5 Mg (U). Other minerals associated with the ore include sulphide, arsenide, and sulpho-arsenide minerals of nickel, cobalt, and radiogenic lead. The ore deposit is surrounded by a thick (5 to 30 m) clay-rich halo, mostly of illite, kaolinite, and quartz, with minor accessory minerals including rutile. The ore deposit is also overlain by an altered sandstone and a quartz-cemented "cap".

Studies on the deposit from 1984 to 1988 concentrated on characterising the relatively undisturbed mineralisation and its surrounding host rock, prior to the onset of mining activities during 1988. A considerable amount of information has been acquired including detailed chemical, physical, and hydrological data, in addition to 85 km of core from over 200 drillholes.

In 1989, the Cigar Lake study was extended through international co-operation with the Swedish Nuclear Fuel Waste Management Company (SKB) for a three-year period. Recent work has concentrated on the hydrogeology and hydrogeochemistry of the site and the impact of the construction of an experimental mine. These underground workings permit water and rock samples to be directly obtained from the deposit with minimum perturbation from drilling. Evidence gathered to date provides direct support for the solubility-limited fuel-dissolution model used in the SYVAC environmental impact assessment code and is helping to build public confidence in the overall disposal concept.

Further information can be obtained from J.J. Cramer, Whiteshell Laboratories, Pinawa, Manitoba, ROE 1LO, Canada [Tel: 1 (204) 753 2311, Tlx: 063671345, Fax: 1 (204) 753 2455].

DEVELOPMENT OF AECL'S BIOSPHERE MODEL

BIOTRAC, a biosphere model for assessing AECL's concept for disposing of nuclear fuel waste in a vault, deep in crystalline rock of the Canadian Shield, has been completed. Together with the vault and geosphere models, it is used for probabilistically predicting environmental impacts and doses to humans from disposal. All these models are being implemented in the systems variability code, SYVAC.

BIOTRAC is composed of closely integrated surface-water, soil, atmosphere, and food-chain and dose submodels. In the assessment, a complex interface model links BIOTRAC, which is generic, to a site-specific geosphere model. The surface-water and soil submodels are time dependent, but the other two submodels assume steady-state conditions. The submodels, and BIOTRAC as a whole, have been subjected to sensitivity analyses, and many of the key parameters are represented by probability density functions.

The development of BIOTRAC has been based on a comprehensive research programme, and rigorous scenario analysis and quality assurance. Recent highlights of the research programme include the development of a method for detecting deep groundwater discharge zones using helium anomalies, establishment of a field study investigating the behaviour of radionuclides in lakes, completion of a data base on soil partition coefficients, and establishment of dose limits based on releases of stable analogues from the geosphere. Together with international programmes such as BIOMOVS, data from the research programme have been used for model validation.

Further information can be obtained from R. Zach, Whiteshell Laboratories, Pinawa, Manitoba, ROE 1LO, Canada [Tel: 1 (204) 753 2311, Tlx: 063671345, Fax: 1 (204) 753 2455].

FINLAND

LICENSING DOCUMENTATION FOR L/ILW REPOSITORY UNDER PREPARATION

The excavation of TVO's (Teollisuuden Voima Oy) Olkiluoto repository for low- and intermediate-level waste (L/ILW) was completed in August 1989 (see Bulletin No. 5). An investigation programme is currently underway with detailed mapping of the underground openings, additional drilling, mechanical monitoring of the structure, and hydraulic monitoring. The aim of the programme is to assess the properties of the bedrock in the repository with respect to meeting the requirements for a safe disposal site. An analysis of the results is underway and three-dimensional groundwater modelling will be used to evaluate the conditions before and after the excavation. The Final Safety Analysis Report (FSAR) will be given to the licensing authorities in 1991.

SAFETY ANALYSIS FOR SPENT FUEL REPOSITORY: TVO-92

TVO is currently conducting preliminary site investigations for deep disposal of spent fuel with the aim of selecting two or three areas for detailed characterisation. In addition to these site investigations, work is being performed to support the development and optimisation of the repository concept and comprehensive safety analysis (TVO-92). In the TVO-92 safety analysis, parameters as well as bedrock properties can be varied, and risks will, in general, be overestimated. The updated safety analysis will not be specific to any of the sites currently under investigation. However, realistic field data will be used. The results from field studies will be used in designing conceptual models for near-field analysis, for migration modelling, etc. The feasibility of technical implementation in the bedrock of each area will also be tested.

Further information on the above items can be obtained from V. Ryhänen, Teollisuuden Voima Oy (TVO), Nuclear Waste Office, Frederikinkatu 51-53B, SF-00100 Helsinki, Finland [Tel: 358 (0) 605 022, Tlx: 122065, Fax: 358 (0) 605 135].

FRANCE

RESEARCH ON SITES FOR GEOLOGICAL DISPOSAL

France, like other countries having a nuclear industry, is studying deep geological disposal for wastes containing significant quantities of long-lived radioelements. It is envisaged that a repository will be constructed in 2010 for alpha-bearing low- and intermediate-level wastes and in 2020 for vitrified high-level wastes.

Following a halt in activities at the sites provisionally chosen for the sinking of deep boreholes (see Bulletin No. 5), the government has received advice from the College for the Prevention of Technological Risks, comprising twelve independent experts, and from the Parliamentary Office for the Evaluation of Scientific and Technological Options. The College first provided technical advice in April 1990. Further advice, published in February 1991, concerned

the placement of waste in the context of nuclear technology options, and institutional aspects.

The Parliamentary Office conducted numerous interviews with interested parties: nuclear companies and institutions, ministries, politicians, scientists, international, national, and local organisations, etc. It also made several visits to foreign laboratories. After a series of public enquiries, its report was issued on 12 December 1990. The Parliamentary Office, like the College, recognised the need to construct a deep underground laboratory (probably two). In addition, the Parliamentary Office thought that studies on advanced reprocessing and transmutation of actinides should be increased.

The government announced on 13 February 1991 that it would submit to Parliament, in the Spring session, a draft law on deep disposal of radioactive wastes, inspired directly by the proposals contained in the report of the Parliamentary Office. This law should therefore establish the regulatory context in which the programme of ANDRA, the national waste management agency, should be conducted, guarantee public access to information as well as the possibility for the public to be kept informed of the progress of work, and provide for local and regional economic incentives. Based on the results obtained, a new law should be prepared in about 10 years to decide on repository construction.

Further information can be obtained from A. Faussat, ANDRA, Route du Panorama - Robert Schumann, B.P. No. 38, F-92266 Fontenay-aux-Roses Cedex, France [Tel: 33 (1) 46 54 97 25, Tlx: 205433 ANDRA, Fax: 33 (1) 46 54 99 25].

FRANCE

RECHERCHE DE SITES EN VUE DU STOCKAGE GEOLOGIQUE

La France, comme les autres pays disposant d'une industrie nucléaire, étudie le stockage en formation géologique profonde pour les déchets contenant des radioéléments de longue période en quantités significatives. Il est envisagé de construire un stockage à l'horizon 2010 pour les déchets de faible et moyenne activité "alpha" et vers 2020 pour les déchets vitrifiés de haute activité.

Suite à l'interruption des activités sur les sites préalablement retenus pour la réalisation de forages profonds (voir Bulletin No. 5), le Gouvernement a reçu l'avis du Collège de la Prévention des Risques Technologiques, groupe de douze experts indépendants et celui de l'Office Parlementaire d'Evaluation des Choix Scientifiques et Technologiques. Le Collège a rendu un avis technique dès le mois d'avril 1990. Un deuxième avis, publié en février 1991, porte plutôt sur la place des déchets dans le contexte des choix techniques du nucléaire, et des aspects institutionnels.

Pour sa part, l'Office Parlementaire a effectué de nombreuses auditions de toutes les parties intéressées: entreprises et institutions du nucléaire, services des ministères, hommes

politiques, scientifiques, associations internationales, nationales et locales, etc. Il a effectué également plusieurs visites dans des laboratoires étrangers. Après quatre journées de synthèses publiques, le rapport a été remis le 12 décembre 1990. L'Office Parlementaire, comme le Collège, reconnaissent la nécessité de construire un stockage souterrain profond national. Ils insistent sur l'urgence de reprendre l'étude de sites et la construction de plusieurs laboratoires souterrains (probablement 2). En parallèle, les études sur le retraitement poussé et la transmutation des actinides devraient être amplifiées.

Le Gouvernement a annoncé le 13 février 1991 qu'il soumettrait au Parlement, à la session de Printemps, un projet de loi sur le stockage en profondeur des déchets radioactifs, s'inspirant directement des propositions contenues dans le rapport de l'Office Parlementaire. Cette loi devrait ainsi fixer le contexte réglementaire dans lequel devra se conduire le programme de l'ANDRA, les garanties d'information et de suivi des travaux pour les populations concernées et les retombées économiques locales et régionales. Une nouvelle loi devrait décider, dans une dizaine d'années, de la construction du stockage au vu des résultats acquis.

Pour plus de renseignements, prendre contact avec A. Faussat, Agence Nationale pour la Gestion des Déchets Radioactifs (ANDRA), Route du Panorama - Robert Schumann, B.P. No. 38, F-92266 Fontenay-aux-Roses Cedex, France [Tel: 33 (1) 46 54 97 25, Tlx: 205433 ANDRA, Fax: 33 (1) 46 54 99 25].

GERMANY

GSF CO-ORDINATES PROGRAMME ON POSTCLOSURE REPOSITORY SAFETY FOR HEAT-GENERATING WASTE

Owing to the safety requirements for the planned Gorleben repository and on the basis of the results of the R&D project "Safety Studies Entsorgung", the programme "Repository Safety in the Post-Operational Phase" was established by the Institut für Tieflagerung (GSF). Co-ordinated on behalf of the Federal Ministry for Research and Technology (BMFT), the purpose is to investigate the long-term safety of heat-generating radioactive waste repositories in rock salt. The programme, which combines projects for experimental data acquisition and the development of methods for safety analyses, from the various R&D institutions, was harmonised with BGR (Hannover), BfS (Salzgitter), and DBE (Peine). The programme consists of R&D in four areas:

- Scenarios and computer codes - Future R&D will focus on the further development of computer codes for modelling groundwater flow and radionuclide transport in the overburden.
- Chemical effects in the near field - Important near-field effects concern the solubility of waste products and the retention of radionuclides by sorption. In addition, the importance of gas production and migration in the repository is still unknown. A specific problem related to the disposal of high-level waste in rock salt concerns the effects of radiation in the vicinity of the waste canisters.
- Geotechnical and physical effects in the near-field - Further R&D concerns the convergence of disposal drifts under ambient pressure, and heat loading from waste

canisters with respect to brine intrusions. The changes of permeability and porosity of the backfilling in the repository, of borehole seals, and of sealing dams are also being studied.

- Transport processes in the geosphere - A vital question concerns the influence of high salinity on the groundwater flow in deep geological formations. Geochemical models have to be extended to ionic concentrations larger than 0.7 Kd, and retardation processes for selected radionuclides have to be investigated in more detail.

Further information can be obtained from W. Brewitz, GSF-Institut für Tieflagerung, Theodor-Heuss-Strasse 4, D-3300 Braunschweig, Germany [Tel: 49 (531) 8012 239, Tlx: 2767-5318228 IFT, Fax: 49 (531) 8012 200].

ITALY

MODELLING OF NATURAL AND ARTIFICIAL CLAY MATERIALS

A joint research effort has been undertaken by ISMES and Atomic Energy of Canada Limited (AECL) to establish the foundations of a comprehensive theoretical treatment of the interaction between water and soil skeleton during thermal dilation of saturated clays. The study is focused on dense and active clays, which are of particular interest in waste disposal, both as potential host rocks and as buffer and backfill materials. The results of previous research indicated that the anomalies observed in the stress-strain response of the clays tested at ISMES might be explained by the altered physico-chemical state of pore water in dense and active clays. As a consequence, if a coupled modelling approach is employed, unsatisfactory predictions of thermally induced pore-water pressure growth and dissipation in the clay medium may occur.

The current study consisted of developing a framework for inclusion of thermally induced water-soil particle interactions into a thermodynamically consistent mixture-theory approach; in particular, possible ways of considering the dependence of the effective thermal expansion coefficient of pore water on its state were studied. Two modelling approaches (the average water approach and mass transfer approach) and the related calibration requirements have been identified. Testing of artificial clays to assess the dependence of pore-water thermal expansion on temperature in the presence of different amounts of active clay minerals has been performed on silica sand (pure quartz) and on pure clays with different mineralogical content (kaolinite, illite, smectite). Tests were run on a prototype one-dimensional cell at AECL.

The pore-water thermal expansion coefficient was found to be nonlinearly dependent on temperature. In addition, clays with higher activity showed a lower α_w value for a given temperature. Tests on Boom clay confirmed a temperature-dependent pore-water expansion coefficient and revealed a value lower than the atmospheric one. This response may be attributed to the presence of smectite and of potentially expansive interlayer minerals.

MODELLING OF BOOM CLAY

Research has been performed by ISMES, with the co-operation of SCK/CEN of Mol, Belgium, and with the financial support of the CEC and the Italian ENEL, to develop and apply advanced constitutive modelling of dense clays to thermo-mechanical loads. The work was focused on improving the prediction of factors contributing to the volumetric response of the clay skeleton: that is, mainly the dilatancy prediction at low to high overconsolidation ratios. Dilation under shear loads (which may lower the thermally induced pore-water pressure) is observed to different degrees, depending on the stress history of the material. To better model this effect, the need for decoupling hardening and compaction on the one hand, from softening and dilation on the other, has been highlighted.

An elasto-plastic constitutive model, capable of accounting for this decoupled behaviour, has been developed. In this model, elasticity is characterised by the additional volume change resulting from the cross effect of the dependence of the shear modulus on the isotropic stress. So far, the model has only been developed for isothermal conditions.

The second volumetric effect which has been studied is swelling. A preliminary interpretive model for swelling pressure prediction, motivated by the notable free swelling measured in the laboratory at high overconsolidation ratios, has been developed. In the model, the isotropic state of stress is equal to the osmotic pressure, and osmotic pressure is considered dependent on temperature and on ionic concentration, according to the diffused double-layer theory.

The development of these new models has been supported by the experimental results obtained for Boom clay at two different depths in the underground research laboratory at Mol. Tests were run at ISMES with a prototype triaxial cell at high temperatures and pressures (HITP). The data were also used to devise a new set of constants for the general hydro-thermo-mechanical model developed at ISMES for clays, and already used for numerical predictions. A finite-element analysis on a long isolated borehole heated by decay heat has been re-run to verify the sensitivity of the boundary value problem to different sets of material constants for the case of Boom clay.

Further information on the above items can be obtained from R. Pellegrini, ISMES S.p.A., Viale Giulio Cesare 29, I-24100, Bergamo, Italy [Tel: 39 (35) 30 73 14, Tlx: 301249 ISMES I, Fax: 39 (35) 21 11 91].

JAPAN

HIGH-LEVEL RADIOACTIVE WASTE MANAGEMENT PROGRAMME

In November 1989, the City of Kamaishi suspended a proposal to construct an underground research laboratory (URL) in a crystalline formation. This year, the prefectural assembly of Hokkaido also passed a resolution to prevent the construction of an URL in a sedimentary environment at Horonobe.

A national review of the HLW R&D programme resulted in the release of a report entitled "Major Targets and Methods of Implementation in R&D for the Geological Disposal of HLW". A major conclusion of the report is that greater priority should be given to performance assessment studies to improve technical confidence and provide a basis for achieving a greater degree of public understanding. Far-field data required for performance assessment will be acquired from various sources, including laboratory experiments with rock samples and a limited number of in situ experiments. The Japanese approach is to assess the generic performance of the geological disposal system at the earliest stage of the R&D programme.

Since the previous issue (No. 5) of the Bulletin appeared, the Shaft Excavation Effect (SEE) Project has been initiated in the Tono area of central Japan, near PNC's sedimentary rock research facilities. A vertical shaft 6 m in diameter and 150 m in depth has been excavated and its mechanical and hydrogeological effects on the surrounding formation are being studied.

Further information can be obtained from S. Hoshiba, Atomic Energy Bureau, Science and Technology Agency, 2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo, Japan [Tel: 81 (3) 3581 5271, Fax: 81 (3) 3581 5198].

REPUBLIC OF KOREA

L/ILW REPOSITORY SITING ACTIVITIES ON HOLD

Owing to strong local protest, the site selection for a low- and intermediate-level (L/ILW) waste repository, and an away-from-reactor spent-fuel interim storage facility in Chungnam province, were cancelled in late 1990. As a result, the Korean Atomic Energy Commission (AEC) is revising the long-term radioactive waste management programme. It is envisaged that KAERI will have to procure the land prior to site investigation, while exerting every possible effort to gain national and regional public acceptance.

Further information can be obtained from H.S. Park, KAERI, P.O. Box 7, Daeduk-Danji, Taejeon, Korea [Tel: 82 (42) 820 2327, Fax: 82 (42) 820 2702].

SPAIN

CONSTRUCTION OF L/ILW REPOSITORY AT EL CABRIL ON SCHEDULE

Construction of the near-surface repository for low- and intermediate-level wastes (L/ILW) at El Cabril is proceeding according to schedule. Construction work began in December 1989, following authorisation by the Ministry of Industry and Energy and a work permit awarded by municipal authorities. The current schedule includes application for an operational license in the first half of 1991, and operation starting in early 1992. The repository concept is similar to the L'Aube facility developed by the French radioactive waste management agency (ANDRA), with whom there is close collaboration.

The long-term storage structures, conceived as a variation of the earth-mounded concrete bunker concept, will have capacity for some 40,000 m³ of L/ILW with a limited content of long-lived alpha emitters. The waste packages, mostly 220 litre drums, will be immobilised inside concrete containers forming concrete blocks weighing some 24 tonnes each. These containers will be placed in contact with each other inside the structures, each of which is capable of holding 320 containers. A lower plate forming the main element of the structure is designed to channel whatever water might have entered into the infiltration control network. During the operational phase, each row of structures will be served by a mobile roof mounted on rails, positioned over the structure in operation. Once the structure is filled and covered, the roof will be moved to the adjacent structure.

In summary, the repository is designed and constructed as a multibarrier system, the main barriers of which are the waste immobilisation matrix and the concrete container in which the wastes are isolated, the lower structural plate, the cover and the infiltration control network, and the surrounding geology.

SITING AND DESIGN FOR HLW REPOSITORY

A new phase of the ongoing siting process for a high-level waste (HLW) repository started in 1990. This phase aims at reducing the total surface and number of favourable areas suitable for further investigation. Field work will be considered for a number of different areas in Spain. In addition, two three-year projects were initiated with the aim of achieving preliminary conceptual designs for HLW repositories in granite and salt. For this purpose, co-operation agreements have been established with the Swedish Nuclear Fuel and Waste Management Company (SKB) and the German Company for the Construction and Operation of Waste Repositories (DBE).

DECOMMISSIONING AND REMEDIAL ACTION OF ANDUJAR URANIUM MILL

In February 1991, ENRESA, the organisation responsible for radioactive waste management in Spain, was granted a license to proceed with the decommissioning and remedial action of the Andujar uranium mill and its mill tailings piles. The project follows the approach applied to sites under the Uranium Mill Tailings Remedial Action Project (UMTRAP), managed by the U.S. Department of Energy.

Further information on the above items can be obtained from A.R. Beceiro, Department of International Relations, ENRESA, Emilio Vargas 7, E-28043 Madrid, Spain [Tel: 34 (1) 519 5255 or 34 (1) 519 5263, Tlx: 41429 ENRES E, Fax: 34 (1) 519 5268].

SWEDEN

CONSTRUCTION OF ÄSPÖ HARD ROCK LABORATORY INITIATED

Construction of the Hard Rock Laboratory (HRL) started in October 1990. At the end of January 1991, approximately 300 m of the access ramp to Äspö Island had been excavated. In total, a ramp 3,850 m in length and 500 m in depth will be constructed. In parallel with the construction work, characterisation of the bedrock in the ramp has been started by two teams working in shifts. Thus, the data base of the bedrock characteristics is being successively expanded. At the end of 1991, a preliminary validation report for the ramp section 0 - 1350 m will be prepared. The report will cover geology, geohydrology, rock mechanics, and groundwater chemistry predictions.

SWEDISH GOVERNMENT APPROVES SKB R&D PROGRAMME

In December 1990, the Swedish Government approved the R&D Programme 89 of SKB, the Swedish Nuclear Fuel and Waste Management Company. The government stressed that binding selections for waste handling and disposal methods should not be made until there is satisfactory understanding of the safety and radiation protection issues. The government recommended a step-wise procedure towards operation of the repository, with the ability to control and modify action. In addition, SKB has been asked to investigate the use of a pilot-scale repository for planning purposes. Furthermore, the government noted that the alternative repository concepts, in the form of very deep boreholes and long ramps under the bottom of the Baltic Sea, appear to be less suitable. After the initial geological assessment, two sites should be submitted for detailed field investigations.

SKB-91 INTEGRATED SAFETY ASSESSMENT UNDERWAY

The SKB has completed the fundamental feasibility studies for high-level waste disposal. Review of alternative sites and repository designs is in progress, and a progressive culling of alternatives with less development potential is being carried out. In this phase, long-term performance and safety studies provide a basis for sensitivity studies whereby the safety role of different barriers or different designs can be assessed.

Compared with earlier safety studies (e.g., KBS-3), the aim in the SKB-91 work is to reduce the safety margins in the calculations as far as possible and avoid highly pessimistic simplifications. This more realistic approach will permit a better quantification of the effects on safety that a change in design would entail. A main role of the assessment is to evaluate the safety role of the various characteristics of a repository site. Through analysis of the effect of variations in parameter values, the importance of existing and possible features will be evaluated. The assessment calculations should be completed by mid-1991.

Further information on the above items can be obtained from T. Papp, SKB, Box 5864, S-102 48 Stockholm, Sweden [Tel: 46 (8) 665 2800, Tlx: 13108 SKB, Fax: 46 (8) 661 5719].

SKI PROJECT-90 COMPLETED

The Swedish Nuclear Power Inspectorate's (SKI) Project-90 was completed at the beginning of 1991. This Project was focused on a performance assessment of a hypothetical repository, the main objective being to explore the uncertainties originating from data interpretation, conceptual understanding, and different scenarios, as a basis for regulatory guidance. The analyses were partly performed with models developed within the Project. For example, the near field was analysed with an integrated model that couples redox-front development with radionuclide migration. Part of the far-field transport was analysed with a discrete-fracture network model. The scenario analysis in Project-90 was based on a joint SKI/SKB scenario development project. In order to handle uncertainties in model input data, simplified submodels were used in the probabilistic code SYVAC/SU.

Frurther information on the above item can be obtained from S. Norrby, SKI, Box 27016, S-102 52 Stockholm, Sweden [Tel: 46 (8) 665 4482, Tlx: 11961 SWEATOM S, Fax: 46 (8) 661 9026].

SWITZERLAND

REFERENDA ON NUCLEAR POWER

The Referendum of 23 September 1990 proposing a phase-out of nuclear power was rejected by 52.9% of the voters. The Referendum of the same date proposing a 10-year moratorium with no new nuclear power production facilities was accepted by 54.6% of the voters.

LOW-LEVEL WASTE DISPOSAL PROGRAMME

Four potential sites for a repository for short-lived low- and intermediate-level (L/ILW) wastes are under consideration: these are Oberbauenstock (marl), Piz Pian Grand (crystalline), Bois de la Glaive (anhydrite), and Wellenberg (marl). At the first two sites, the first phase of drilling and seismic investigations was completed some time ago. Applications for permits to drive tunnels at these two sites and at Bois de la Glaive were submitted to the Government in 1988, although local opposition at the anhydrite site had prevented first-phase field work from being completed beforehand. The government decision, taken in 1990, was that all four sites in question should be studied from the surface to a level sufficient to decide upon a single site at which a tunnel will be driven into the potential repository zone.

Further field work is now underway. Hydrogeological measurements are in progress at Bois de la Glaive and a seismic campaign, which will necessitate temporary land-use expropriation, is planned. At Wellenberg, seismic surveys are complete and drilling is in progress in the second and third of a first series of five planned boreholes.

HIGH-LEVEL WASTE DISPOSAL PROGRAMME

With the conclusion of the regional Phase I of the crystalline rock investigations in northern Switzerland, preparations are being made for a global synthesis of the programme results. This study, Kristallin-I, is aimed at re-evaluating the safety of a deep repository in the crystalline bedrock and at selecting promising sites for more detailed characterisation.

In the parallel programme for investigation of sedimentary host rocks, consultations between NAGRA and government experts have resulted in programmes for further studies in Opalinus Clay and Fresh Water Molasse. The clay programme is at a more advanced stage, which should involve specific field work (primarily regional seismic surveys) starting in 1991. In the molasse programme, promising localities for study sites are being identified; should the first phase of clay investigations fail to yield sufficiently promising results, field work in molasse will be initiated.

DISPOSAL-SPECIFIC REQUIREMENTS ON WASTE CONDITIONING

Safety authority regulations require new conditioning methods for radioactive wastes to be licensed. The current version of the corresponding guideline, R-14, requires the waste conditioner to receive from NAGRA a formal confirmation of the disposability of the waste form. This has involved NAGRA in waste-specific safety analyses for several, greatly differing waste types. In the last year these have included ion-exchange resins and fuel-element boxes from nuclear power plants, plutonium-contaminated waste from experimental fuel development, and large, activated components from accelerator facilities.

INTERMEDIATE-STORAGE FACILITIES UNDER LICENSING

Increased capacity is needed in Switzerland for interim storage of radioactive wastes. In particular, intermediate- and high-level waste from the reprocessing of spent nuclear fuel requires adequate storage before final disposal. There are two such projects in the licensing stage now. One facility is at the site of the Beznau Power Plant and is designed to hold operational and reprocessing waste derived from the plant's own fuel management. This facility is due to obtain the necessary construction permits in 1991. It is expected to start operation in 1993.

The other project is a central waste treatment and storage facility, serving all of the nuclear power companies and offering various waste conditioning services. This facility is to be built at Würenlingen, in the northern part of Switzerland. The application for a siting permit was filed in July 1990. The facility is expected to come into operation in 1996, at the earliest. Both of these facilities offer the possibility of dry storage of spent-fuel elements in transport or storage casks.

Further information on the above items can be obtained from C. McCombie, NAGRA, Hardstrasse 73, CH-5430 Wettingen, Switzerland [Tel: 41 (56) 37 11 11, Fax: 41 (56) 37 12 07].

UNITED KINGDOM

GOVERNMENT POLICY

As part of long-standing Government strategy for the disposal of low- and intermediate-level wastes (L/ILW), UK Nirex Ltd. has the task of developing a deep underground repository to isolate the wastes from the environment. Nirex's investigations are subject to normal planning procedures, and the Government will make any proposal for development subject to a full public inquiry. Government policy towards radioactive waste disposal was published in its White Paper "This Common Inheritance" (Cm 1200, September 1990) which states that, amongst other points

- UK Nirex Ltd. will speed up its investigations into a potential underground waste disposal site so that a well-founded proposal can come to a public inquiry as soon as possible;
- the Government will ensure that waste arising from post-1976 reprocessing contracts is returned to overseas customers;
- the Government, in consultation with the nuclear industry, will publish a strategy for nuclear R&D examining in part the scope for collaboration with other countries.

Further information on the above item can be obtained from R. Carthew, Department of the Environment, Romney House, 43 Marsham Street, London SW1P 3PY, United Kingdom [Tel: 44 (71) 276 8102, Tlx: 22221, Fax: 44 (71) 276 8100].

WORK PROGRESSES AT POTENTIAL L/ILW DEEP REPOSITORY SITES

UK Nirex Ltd., having reduced its list of possible sites for a deep repository for L/ILW to Sellafield and Dounreay, is currently engaged in exploratory borehole work at both sites. Drilling at Sellafield has reached 1,000-m depth, and testing of water flow and the regional seismic and electromagnetic survey work are well under way. Similar progress is being made at Dounreay, where the first borehole has now reached over 400-m depth. Both sites have the potential for a good quality hard-rock repository. Nirex is likely to make a decision to concentrate on one of them at the end of 1991, unless drilling results indicate that neither is satisfactory. Following a planning inquiry into the application to explore the chosen site and build a repository, extensive geological work will continue well into the 1990s, with the current target date for commissioning of the deep repository being 2005.

NEW VITRIFICATION AND CEMENTATION PLANTS

In 1990 British Nuclear Fuels plc (BNFL) commissioned major new plants for the vitrification of high-level waste and the cementation of fuel-element hulls at Sellafield. AEA Technology also has two cementation plants under construction at Dounreay and Winfrith for the packaging of various intermediate-level wastes in a form acceptable for the deep repository.

Further information on the above two items can be obtained from R.H. Flowers, AEA Technology, Harwell Laboratory B10, Oxfordshire OX11 0RA, United Kingdom [Tel: 44 (235) 43 57 23, Tlx: 83135 ATOMHA G, Fax: 44 (235) 43 29 78].

LOW-LEVEL WASTE DISPOSAL AT DRIGG

BNFL is continuing to appraise developments which would use its low-level radioactive waste site at Drigg more effectively and efficiently. Emphasis has been placed on using the potentially empty space in the completed vault, container corrosion and waste degradation, and the long-term integrity of the vault closure-cap. The option now being implemented will make effective use of high-force compaction of wastes (with a 1-m³ box compactor), grouting within a product container, and deposition of such conditioned waste in a relatively simple concrete vault. A Waste Monitoring and Compaction facility is expected to be operational in 1993.

Far-field and near-field studies are being developed to provide databases relevant to the Drigg site. Near-field characterisation work includes study of waste degradation and gas generation, water lysimeter leaching, sorption and solubility, evaluation of the effect of concrete on engineered clay, and evaluation of the ageing of barriers.

Further information on the above item can be obtained from P.D. Grimwood, BNFL Waste Management Unit, Sellafield, Seascale, Cumbria CA20 1PG, United Kingdom [Tel: 44 (9467) 71634, Tlx: 64237, Fax: 44 (9467) 28987].

UNITED STATES

DOE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT COMPLETES REORGANISATION

Dr. John Bartlett, Director of the U.S. Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM), announced a major reorganisation of the programme. The OCRWM programme, responsible for developing the U.S. system for management and disposal of spent fuel and high-level radioactive waste, has been reorganised to provide a more effective implementation of the major elements of the Nuclear Waste Policy Act of 1982, as amended, and a clear separation of the headquarters' policy and guidance role and the field implementation role. A list of key functions of the offices within the OCRWM organisation is presented below:

- Office of Strategic Planning and International Programs - responsible lead for strategic, long-range, and contingency planning, and for managing relations with programmes in other nations;
- Office of Geologic Disposal - responsible for scientific evaluation of whether or not Yucca Mountain, Nevada, is suitable for development of a deep geologic repository;
- Office of Storage and Transportation - responsible for directing monitored retrievable storage, development of a transportation system, cask development, development of spent-fuel acceptance systems, and systems logistics activities;
- Office of Systems and Compliance - responsible for establishing programme requirements

with management and operating contractor and support services contractors, and for managing consolidation of contractor services;

- Office of Program and Resource Management - responsible for managing programme information systems and budget activities, and for providing administrative support services, including acquisition and development of human resources;
- Office of External Relations - responsible for managing intergovernmental relations and interactions with affected and interested parties, and for managing education and public information programmes;
- Office of Quality Assurance - Responsible for developing programme quality-assurance requirements and overseeing compliance, and for interface with the Nuclear Regulatory Commission quality-assurance requirements.

OVERALL STATUS OF THE DEVELOPMENT OF A DEEP GEOLOGIC REPOSITORY FOR SPENT NUCLEAR FUEL

Dr. John Bartlett has initiated a management systems improvement plan for the programme of developing a deep geological repository for spent fuel. Improvements in the management system consist in large part of rigorously applying systems engineering principles to system functions and requirements across defined interfaces to allow total programme integration. Management systems and projected budgets are targeted for the primary near-term objectives of OCRWM's accepting spent fuel in 1998 and establishing whether or not the Yucca Mountain site is suitable as a deep geologic repository. Access to the Yucca Mountain candidate repository site continues to be blocked by the State of Nevada's refusal to grant permits, and their appeal of a court decision that was in favour of the U.S. Department of Energy is now before the U.S. Supreme Court. Resolution of this issue may require Congressional action, and requesting such action is an option being considered by the U.S. Department of Energy. The Department is ready to begin work on the site as soon as access is achieved, and progress is currently being made in site investigations using existing boreholes and trenches.

NUCLEAR WASTE NEGOTIATOR APPOINTED FOR SITING MONITORED RETRIEVABLE STORAGE FACILITY AND DEEP GEOLOGIC REPOSITORY

Late in 1987, the U.S. Congress directed that an Office of the Nuclear Waste Negotiator be established, independent of the Department of Energy, to find jurisdictions willing to host either a monitored retrievable storage (MRS) facility or a permanent geologic repository. David Leroy was nominated by the President and was confirmed to be the Nuclear Waste Negotiator. All aspects of his Office's process for approaching States and Indian tribes will be completely open, and no dealings will be confidential. In order for the U.S. Department of Energy's Office of Civilian Radioactive Waste Management to receive spent nuclear fuel in 1998, a site must be found for an MRS facility. The Request for Proposals, to be sent out from the Negotiator's Office later this year, will be for both the MRS and the repository, and will contain a menu of benefits that will be open to negotiation, including a number of significant infrastructure enhancements or

Civilian Radioactive Waste Management to receive spent nuclear fuel in 1998, a site must be found for an MRS facility. The Request for Proposals, to be sent out from the Negotiator's Office later this year, will be for both the MRS and the repository, and will contain a menu of benefits that will be open to negotiation, including a number of significant infrastructure enhancements or improvements.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT ESTABLISHES QUALITY ASSURANCE PROGRAMME

The U.S. Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM) has established a quality-assurance (QA) programme that meets the requirements of the U.S. Nuclear Regulatory Commission. Under the QA programme, OCRWM and contractor personnel performing quality-affecting work must be certified as being professionally qualified to do their assigned jobs. QA requirements and procedures must also be established and acceptable for the work to be done.

Further information on the above four items can be obtained from T.H. Isaacs, Director of the Office of Strategic Planning and International Programs, OCRWM, U.S. DOE, Forrestal Building, RW, Washington, D.C. 20588, United States [Tel: 1 (202) 586 2277, Tlx: 7108220176, Fax: 1 (202) 586 8134].

OFFICE OF ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT PLANS INTEGRATED DEMONSTRATIONS

The U.S. Department of Energy's Office of Environmental Restoration and Waste Management was established in 1989 to integrate management, fiscal control, and technology development for the environmental cleanup and waste management of all DOE facilities. For environmental restoration, technology needs have been identified in the areas of cleanup of groundwater, soil, and buried objects (e.g., buried drums of waste). These technology needs are being addressed through a new concept called integrated demonstrations (ID). Integrated demonstrations will be used as a means to rapidly develop, demonstrate and transfer needed technology to the environmental restoration and waste management efforts. The integrated demonstration is a cost-effective mechanism that evaluates the performance of multiple related technologies at a single site that are applicable to most DOE sites as part of a complete system in correcting waste management and environmental problems from "cradle-to-grave". An integrated demonstration involves three major facets: (1) the various steps to solving the problem(s) (e.g., planning, site characterisation, waste treatment, waste disposal, site monitoring), (2) development and application of innovative technology solutions, and (3) evaluations of the technologies relative to performance goals and applicable regulatory requirements.

The first integrated demonstration began in October 1989. This ID is comparing technologies for remediation of volatile organics (e.g., trichloroethylene, perchloroethylene) in soils and groundwater at nonarid sites. Similar technologies will then be evaluated for remediation of arid sites. Another ID will compare treatment and disposal of mixed wastes from buried waste sites. A major problem for many sites is the remediation of underground storage tanks (USTs).

soils. Co-operative efforts with the Environmental Protection Agency and the Department of Defense include testing of a plasma centrifugal furnace to destroy and immobilise hazardous chemical waste constituents from soils, and the development of the cone penetrometer for quickly characterising sites.

In the area of waste management, technology needs have been identified for the treatment of various classifications of waste and for minimisation of wastes. Waste minimisation activities include efforts to develop uranium metal processing and recycling technologies, plasma etching technology development (using laser ablation to remove thin layers of material surfaces), and spray casting techniques. Co-operative efforts in this area include finding alternatives to the use of chlorinated solvents.

WIPP EXPECTED TO START TEST PHASE DURING 1991

Construction of the Waste Isolation Pilot Plant (WIPP), a transuranic waste demonstration repository in a deep salt formation, has been completed. However, initiation of the test phase with waste has been delayed by technical, regulatory and institutional requirements. Start-up of the test phase with limited quantities (about 0.5%) of the transuranic waste planned for the repository is now expected in mid-1991. The test phase is planned to provide necessary data to determine compliance with U.S. Environmental Protection Agency disposal standards prior to a decision to proceed with disposal of transuranic waste. The test phase is expected to last five years. If evaluations of the test phase show satisfactory performance, the WIPP facility may be used as the repository for DOE transuranic wastes.

Further information on the above two items can be obtained from C. Cooley, Office of Environmental Restoration and Waste Management, U.S. DOE, 12800 Middlebrook Road, Suite 400, Germantown, MD 20874, United States [Tel: 1 (301) 353 7286, Fax: 1 (301) 353 4690].

EPA TO PUBLISH PROPOSED RADIOACTIVE WASTE STANDARDS IN 1991

The U.S. Environmental Protection Agency (EPA) is continuing its programme 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 predisposal management and storage operations,
- criteria for wastes that are Below Regulatory Concern (BRC),
- postdisposal exposure limits,
- groundwater protection requirements, and

- postdisposal exposure limits,
- groundwater protection requirements, and
- qualitative implementation requirements.

A proposed standard will also be published for public review and comment in the course of 1991 requiring the disposal in regulated radioactive waste disposal facilities of specific high-concentration, relatively low-volume, naturally occurring and accelerator-produced radioactive material (NARM) wastes exceeding 2 nCi/g, but excluding some consumer items.

In addition, the EPA intends to publish in 1991 for public review and comment revised proposed environmental standards for the management and disposal of spent nuclear fuel, high-level, and transuranic wastes. These standards were remanded to the EPA in 1987 by the U.S. Court of Appeals for the First Circuit. The rulemaking will concentrate on the issues raised by the Court in its remand, and public comment on those aspects of the revised disposal standards will be considered.

Further information on the above item can be obtained from G. Burley, Office of Radiation Programs, U.S. EPA, ANR-458C, 401 M Street, SW, Washington, D.C. 20460, United States [Tel: 1 (703) 557 9710, Tlx: 892758].

TOPICAL REPORT

Disposal of Radioactive Waste: Can Long-Term Safety be Evaluated?

An International Collective Opinion

This Topical Report includes the Foreword and Executive Summary from this international Collective Opinion, recently published by the OECD/NEA. The Collective Opinion was prepared in order to reinforce the conclusions of the 1989 Paris Symposium on the safety assessment of radioactive waste repositories, which was jointly sponsored by the OECD/NEA, the CEC, and the IAEA. An extensive summary of this symposium appeared in the previous issue (No. 5) of the Bulletin, and full proceedings have also been published by the OECD.

The Collective Opinion is available free-of-charge from the NEA Secretariat.

FOREWORD

The safe disposal of radioactive waste, particularly as regards the need to protect humans and the environment in the far future, is a subject of broad concern in all countries engaged in nuclear energy production. It is also of concern in many other countries making use of radioactive materials only for medical, industrial, or research purposes.

This report presents a collective opinion of the OECD/NEA Radioactive Waste Management Committee and of the IAEA International Radioactive Waste Management Advisory Committee on the methodology and means for assessing the safety of radioactive waste disposal practices and concepts. It has been endorsed by the CEC Experts for the Community Plan of Action in the Field of Radioactive Waste Management.

This report is concerned with radioactive waste disposal. It should be stressed, however, that there are many other nonradioactive types of hazardous wastes with real or potential environmental impacts. Radioactive wastes are just a part of the overall waste management and disposal problems confronting society today.

EXECUTIVE SUMMARY

Radioactive waste disposal systems are designed to isolate the waste from humans and the environment for the necessary times to ensure that no potential future releases of radioactive substances to the environment would constitute an unacceptable risk. Such systems have been built at or near the surface for low-level and short-lived wastes, and are widely envisaged to be built deep underground in geological formations for high-level and long-lived wastes.

The long-term safety of any hazardous waste disposal system must be convincingly shown prior to its implementation. For radioactive wastes, safety assessments over timescales far beyond the normal horizon of social and technical planning have already been conducted in many countries. These assessments provide the principal means to investigate, quantify, and explain long-term safety of each selected disposal concept and site for the appropriate authorities and the public. Such assessments are based on four main elements: definition of the disposal system and its environment, identification of possible processes and events that may affect the integrity of the disposal system, quantification of the radiological impact by predictive modelling, and description of associated uncertainties.

The NEA Radioactive Waste Management Committee and the IAEA International Radioactive Waste Management Advisory Committee have carefully examined *the current scientific methods* for safety assessments of radioactive waste disposal systems, as briefly summarised in this report. The Committees have also reviewed *the experience now available* from using safety assessment methods in many countries, for different disposal concepts and formations, and in the framework of both nationally and internationally conducted studies, as referenced in this report.

Following this review, the NEA Radioactive Waste Management Committee and the IAEA International Radioactive Waste Management Advisory Committee

- **Recognise** that a correct and sufficient understanding of proposed disposal systems is a basic prerequisite for conducting meaningful safety assessments,
- **Note** that the collection and evaluation of data from proposed disposal sites are the major tasks on which further progress is needed,
- **Acknowledge** that significant progress in the ability to conduct safety assessment has been made,
- **Acknowledge** that quantitative safety assessments will always be complemented by qualitative evidence, and
- **Note** that safety assessment methods can and will be further developed as a result of ongoing research work.

Keeping these considerations in mind, the two Committees:

- **Confirm** that safety assessment methods are available today to evaluate adequately the potential long-term radiological impacts of a carefully designed radioactive waste disposal system on humans and the environment; and
- **Consider** that appropriate use of safety assessment methods, coupled with sufficient information from proposed disposal sites, can provide the technical basis to decide

whether specific disposal systems would offer to society a satisfactory level of safety for both current and future generations.

This Collective Opinion is *endorsed* by the CEC Experts for the Community Plan of Action in the Field of Radioactive Waste Management.

RAPPORT SUR UN SUJET PARTICULIER

Évacuation des Déchets Radioactifs: Peut-On Évaluer la Sûreté à Long Terme?

Une Opinion Collective Internationale

Ce rapport sur un sujet particulier comprend l'avant-propos et le résumé de cette Opinion collective internationale, qui a été publiée récemment par l'OCDE/AEN. L'Opinion collective a été établie pour mettre en évidence les conclusions du Colloque 1989 de Paris sur l'analyse de la sûreté des dépôts de déchets radioactifs, organisé conjointement par l'OCDE/AEN, la CCE et l'AIEA. Un résumé détaillé de ce Colloque figurait dans le dernier numéro du Bulletin (No. 5), et un compte rendu complet a également été publié par l'OCDE.

L'Opinion Collective est disponible gratuitement auprès du Secrétariat de l'AEN.

AVANT-PROPOS

L'évacuation des déchets radioactifs dans des conditions de sûreté, compte tenu notamment de la nécessité de protéger les êtres humains et l'environnement dans un avenir lointain, suscite de grandes préoccupations dans tous les pays dotés d'un parc électronucléaire. Elle constitue aussi un sujet de préoccupation dans bien d'autres pays où les matières radioactives ne sont utilisées qu'à des fins médicales et industrielles ou dans la recherche.

Le présent rapport expose l'opinion collective du Comité AEN/OCDE de la gestion des déchets radioactifs et du Comité consultatif international de l'AIEA sur la gestion des déchets radioactifs au sujet de la méthodologie et des moyens permettant d'analyser la sûreté des pratiques et concepts d'évacuation des déchets radioactifs. Elle a été entérinée par les Experts de la CCE chargés du Plan d'action de la Communauté dans le domaine de la gestion des déchets radioactifs.

Ce rapport a trait à l'évacuation des déchets radioactifs. Toutefois, il y a lieu de souligner que de nombreux types de déchets dangereux autres que radioactifs ont des incidences réelles

ou potentielles sur l'environnement. Les déchets radioactifs ne représentent qu'une partie de l'ensemble des problèmes de gestion et d'évacuation des déchets auxquels la société est confrontée à l'heure actuelle.

RESUME

Les systèmes d'évacuation des déchets radioactifs sont conçus pour isoler les déchets des êtres humains et de l'environnement pendant les périodes de temps requises pour s'assurer qu'aucun rejet futur potentiel de substances radioactives dans l'environnement ne constituera un risque inacceptable. De tels systèmes ont été construits à la surface ou à proximité de cette dernière dans le cas des déchets de faible activité à vie courte, cependant qu'il est généralement envisagé de les construire à grande profondeur dans des formations géologiques dans le cas des déchets de haute activité à vie longue.

Il convient d'établir de façon convaincante la sûreté à long terme de tout système d'évacuation de déchets dangereux préalablement à sa mise en oeuvre. En ce qui concerne les déchets radioactifs, des analyses de sûreté portant sur des échelles de temps bien supérieures à celles normalement retenues pour la planification sociale et technique ont déjà été effectuées dans de nombreux pays. Ces analyses offrent le principal moyen d'étudier, de quantifier et d'expliquer aux autorités compétentes et au public la sûreté à long terme de chacun des concepts et sites d'évacuation choisis. Ces analyses reposent sur quatre principaux éléments : (1) la définition du système d'évacuation et de son environnement, (2) la détermination des processus et événements susceptibles d'influer sur l'intégrité du système d'évacuation, (3) la quantification des incidences radiologiques grâce à la modélisation prévisionnelle et (4) la description des incertitudes connexes.

Le Comité AEN de la gestion des déchets radioactifs et le Comité consultatif international de l'AIEA sur la gestion des déchets radioactifs ont étudié attentivement *les méthodes scientifiques actuelles* permettant d'analyser la sûreté des systèmes d'évacuation des déchets radioactifs, telles qu'elles sont brièvement résumées dans le présent rapport. Ces Comités ont également examiné *l'expérience actuellement disponible* par suite de l'application de méthodes d'analyse de sûreté dans de nombreux pays, dans le cas de différents concepts d'évacuation et formations réceptrices, et dans le cadre des études menées à l'échelon tant national qu'international, dont il est fait mention dans ce rapport.

A la suite de cet examen, le Comité AEN de la gestion des déchets radioactifs et le Comité consultatif international de l'AIEA sur la gestion des déchets radioactifs

- **Reconnaissent** qu'une connaissance correcte et suffisante des systèmes d'évacuation proposés est une condition préalable essentielle à la réalisation d'analyses de sûreté valables,
- **Notent** que la collecte et l'évaluation des données relatives aux sites d'évacuation proposés constituent les principales tâches qui demandent à être poussées plus avant,

- **Reconnaissent** que l'aptitude à effectuer des analyses de sûreté a sensiblement progressé,
- **Reconnaissent** que les analyses quantitatives de sûreté s'assortiront toujours d'éléments d'appréciation qualitatifs, et
- **Notent** que les méthodes d'analyse de sûreté pourront être et seront encore perfectionnées à la suite des travaux de recherche en cours.

Compte tenu de ces considérations, les deux Comités :

- **confirment** que l'on dispose à l'heure actuelle de méthodes d'analyse de sûreté permettant d'évaluer de façon adéquate les incidences radiologiques potentielles à long terme, sur les êtres humains et l'environnement, d'un système d'évacuation des déchets radioactifs soigneusement conçu; et
- **estiment** que l'utilisation judicieuse des méthodes d'analyse de sûreté, assortie d'informations suffisantes au sujet des sites d'évacuation proposés, peut constituer la base technique permettant de déterminer si des systèmes d'évacuation spécifiques offriront à la société un niveau de sûreté satisfaisant pour les générations tant actuelles que futures.

Cette opinion collective est entérinée par les Experts de la CCE chargés du Plan d'action de la Communauté dans le domaine de la gestion des déchets radioactifs.

UPDATE OF NEA PROGRAMME ACTIVITIES

MISE A JOUR DU PROGRAMME D'ACTIVITES DE L'AEN

RADIOACTIVE WASTE MANAGEMENT COMMITTEE

The NEA's programme in the area of radioactive waste management is conducted under the guidance of the NEA Radioactive Waste Management Committee (RWMC), a standing Committee established in 1975, with the assistance of two principal advisory groups, the Performance Assessment Advisory Group (PAAG, established 1985) and the Co-ordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal (SEDE, established 1990). At the Twenty-Second Meeting of the RWMC, held in Paris in September 1990, three activities were discussed in particular detail:

- a workshop organised under the joint auspices of the RWMC and the NEA Committee on Radiation Protection and Public Health (CRPPH) on radiation protection and safety criteria for the disposal of high-level radioactive waste - this workshop was subsequently held in Paris in November 1990, and is reported on in more detail later in this issue of the Bulletin;
- a proposed ad hoc meeting on environmental restoration and waste minimisation activities - this meeting was subsequently held in Paris in March 1991, and is reported on in more detail later in this issue of the Bulletin;
- final agreement was reached on the text of a RWMC Collective Opinion on methods for long-term safety assessment - this Opinion, also endorsed by the relevant committees of the CEC and the IAEA, was published by the OECD in early 1991 and is available free-of-charge from the NEA Secretariat. The Foreword and Executive Summary of this Opinion are included as a Topical Report in this issue of the Bulletin.

The Twenty-Third Meeting of the RWMC will be held in Paris on 6-7 June 1991.

Further information can be obtained from J.-P. Olivier of the NEA Secretariat.

PERFORMANCE ASSESSMENT ADVISORY GROUP

The NEA Performance Assessment Group (PAAG) has the mandate to advise the Radioactive Waste Management Committee (RWMC) on technical aspects of the performance assessments of radioactive waste disposal systems and to help co-ordinate NEA activities in this area. In addition, the Group serves as an international forum for discussion and information exchange between the Member countries on performance assessment matters, and has established working groups, held workshops and symposia, etc. The overall aim of the PAAG programme is to assist in the development of methods and tools of high quality for the assessment of the safety of radioactive waste repositories. It also aims at promoting a balanced and coherent use of these methods within radioactive waste disposal programmes of OECD/NEA Member countries.

NEA PERFORMANCE ASSESSMENT PROGRAMME UNDER REVIEW

The Sixth Meeting of PAAG was held in Paris in October 1990. At this meeting, the future programme of PAAG was discussed. Following the PAAG meeting, an overall performance assessment plan was prepared by the NEA Secretariat for submission to the RWMC at its upcoming meeting in June 1991. The proposed programme following the first phase (1986-1990) of PAAG activities has three major components:

- continuation of ongoing activities, e.g., PSAG, ARAP, participation in INTRAVAL,
- follow-up actions to earlier initiatives, e.g., on scenarios and on human intrusion, and
- new activities in areas not dealt with previously in detail, e.g., near-field modelling and biosphere modelling.

Progress within PSAG, ARAP, and INTRAVAL, as well as plans regarding two PAAG workshops during 1991, are reported later in this issue of the Bulletin. In addition, several items within the PAAG programme will be highlighted here.

OVERALL APPROACHES TO SAFETY ASSESSMENT

There are several different approaches being applied in Member countries with varying degrees of complexity and conservatism. Feedback from method development and actual assessments in terms of results and experiences will be regularly reported and discussed at the meetings of PAAG. Several difficult issues will be addressed at topical sessions during future PAAG meetings:

- how to structure and simplify assessments without jeopardising the validity of the conclusions, i.e., how to make and justify the conservative assumptions needed for a robust assessment,

- the use of performance assessment in assigning research priorities,
- the use of performance assessment in the site investigation and selection process,
- the use of performance assessment in giving guidance for site development and repository construction,
- safety assessment in the licensing procedure, and
- how to present the results in a clear and coherent way.

SCENARIO DEVELOPMENT

A Working Group on the Identification and Selection of Scenarios for Performance Assessment of Radioactive Waste Disposal was set up by PAAG in 1987. It has extensively reviewed approaches to and experiences of scenario development in Member countries, and a final report of the Group will be published during Spring 1991. The report will provide a summary of the state-of-the-art in this area, including recent experiences of scenario studies performed in several Member countries.

Discussions at PAAG and RWMC meetings have confirmed that scenario development continues to be an area of high priority particularly suitable for international co-operation. It is for instance envisaged to explore the possibility of establishing an international data base with information about features, events, and processes (FEPs) that may need to be considered in scenario development for safety assessment of radioactive waste disposal. Further studies of the procedures for formation of scenarios using such FEP databases will also be considered.

HUMAN INTRUSION

In June 1989, the NEA organised the first international workshop on the risks associated with human intrusion at radioactive waste disposal sites. Recommendations from this workshop, and discussions within PAAG and at the safety criteria workshop for further actions by NEA in this area include:

- development of a rationale and philosophical framework for how to approach and present assessments of human intrusion,
- promotion and organisation of further exchanges of information and documentation at an international level, for instance by creation of a forum for a systematic and detailed comparison of models and data used in human intrusion assessments,
- study of methods for conservation and retrieval of information at an international level, and
- discussions on low-probability high-consequence intrusion scenarios.

Owing to the interest of many Member countries for further international work on issues like those mentioned above, it has been decided by the RWMC, on proposal by PAAG, to set up an NEA Working Group on the Assessment of Future Human Actions at Radioactive Waste Disposal Sites. The Group will provide a forum for a broad information exchange regarding this issue. It is hoped that this Group will be able to reach some common ground concerning the general philosophy regarding reasonable approaches to the issue of future human actions at disposal sites. The First Meeting was held in Paris on 3-5 April 1991.

BIOSPHERE MODELLING

PAAG had a topical session on biosphere modelling for safety assessment of radioactive waste disposal at its meeting in October 1988. The discussions focused around the question of uncertainties in biosphere modelling in the long term, and the need for and the feasibility of making detailed biosphere modelling. At its latest meeting, PAAG agreed to explore the possibilities to help develop standardised approaches (stylised scenarios) for biosphere modelling in the context of safety assessments of radioactive waste repositories. This idea was presented to the BIOMOVs Secretariat, which has subsequently set up a working group on this subject. This group would

- ensure that the scenarios are adequately representative,
- provide as much scientific justification as possible for these scenarios,
- provide a clear documentation of developed scenarios, and
- investigate uncertainties associated with such simplified scenarios.

Further information on the above items can be obtained from C. Thegerström of the NEA Secretariat.

PROBABILISTIC SYSTEM ASSESSMENT CODE USER GROUP

The Probabilistic System Assessment Code (PSAC) User Group was established in 1985 by the NEA Radioactive Waste Management Committee to further the development in Member countries of computer codes for the probabilistic safety assessment (PSA) of radioactive waste disposal systems. The last meeting of the Group, its Eleventh, took place in Paris in October 1990. At this meeting, the future of the Group was discussed in detail, and agreement was reached, inter alia,

- that the scope of its discussions should be broadened to consideration of PSA issues beyond code development and verification,

- that its scope should in fact include consideration of all aspects of integrated PSA from a technical viewpoint, and
- that its name should accordingly be changed from the Probabilistic System Assessment Code (PSAC) User Group to the Probabilistic System Assessment Group (PSAG).

In addition, a Topical Session was held on "National site-specific probabilistic safety assessments". A report of this Session, comprising the five papers presented, will be published informally by the NEA.

Also at the Eleventh Meeting, the ongoing series of code intercomparison (PSACOIN) exercises was discussed in detail. Agreement was reached on the final text for the Level 1a exercise, the third report in this series to be completed (the first two reports were published by the NEA in 1987 and 1989). The Level 1a exercise represents a step toward an intercomparison based on a more realistic system model - in this case, involving deep geological disposal concepts and hypothetical waste inventories with a relatively complex structure of the repository vault. The primary purpose of this exercise was to begin to evaluate the relative magnitude of the differences arising from the use of different approaches to modelling a set of given processes expected to be of importance in the safety assessment of radioactive waste disposal, and to weigh these differences against the variations arising from (specified) uncertainties in the input data. The final report was published by the NEA at the end of 1990.

In contrast to other PSACOIN exercises, the fourth exercise, Level S, has focused on comparing different techniques for sensitivity analysis, both established and novel - an area of major discussion with the Group. The participants were all provided the same set of input and output data, and were asked to quantify the effects of varying input data distribution characteristics on the characteristics of the distribution of outputs for a series of parameters. Results from this exercise will be published in late 1991.

The fifth exercise, PSACOIN Level 1b, continues the trend, exemplified by the Level 1a exercise, towards the use of more realistic submodels. Level 1b focuses, however, on the biosphere, incorporating a relatively detailed model of the transport mechanisms that influence the environmental concentrations of radionuclides. The biosphere has been the most idealised part of the previous PSACOIN exercises. In addition, the specification of the exercise was developed with a view to ensuring consistency with certain concepts for the near-surface disposal of low-level radioactive wastes. Final probabilistic calculations have been completed for this exercise, and analysis is currently being undertaken with a view to completion and publication of the report in early 1992.

The latest PSACOIN exercise, discussed in detail by the Group at its Eleventh Meeting, has been termed Level 2. The proposed exercise is concerned with the application of PSA techniques to real site data (in the first instance, the WIPP site in the United States), treatment of uncertainty in conceptual models and in the derivations of probability density functions, and study of the variations in overall uncertainty in a PSA as a function of the amount of available site data. The broad outlines have been approved by both PSAG and the NEA Performance Assessment Advisory Group, and a detailed specification is currently under preparation.

Finally, the Group was responsible for the preparation of a brochure, written for a wide

audience, on PSA and the work of the Group. This brochure was completed in late 1990 with the invaluable assistance of J.E. Sinclair of AEA Technology (United Kingdom), and copies are available free-of-charge from the NEA Secretariat.

The Twelfth Meeting of PSAG will be held in Paris on 12-14 November 1991.

Further information can be obtained from D.A. Galson of the NEA Secretariat.

CO-ORDINATING GROUP ON SITE EVALUATION AND DESIGN OF EXPERIMENTS FOR RADIOACTIVE WASTE DISPOSAL (SEDE)

The First Meeting of the Group was held in Paris on 25-26 October 1990, immediately following its first technical workshop, on methodologies for the investigation and interpretation of spatial variability and heterogeneity of hydrological systems in site evaluation programmes. This workshop is reported on later in this issue of the Bulletin. The Group elected Timo Äikäs (TVO, Finland) as its Chairman at its First Meeting. Under his chairmanship, the Group agreed on a programme of work to be carried out over the next year or so:

- a workshop on needs and techniques for long-term observation of the geological environment, to be held in Helsinki, Finland, on 9-11 September 1991 (discussed in detail later in this issue of the Bulletin),
- a workshop, to be organised jointly with PAAG, on gas generation and release from radioactive waste repositories, to be held in Aix-en-Provence, France, on 23-26 September 1991 (discussed in detail later in this issue of the Bulletin),
- a working group meeting on measurement and physical understanding of groundwater flow through argillaceous media, held in Baden, Switzerland, on 14-15 March 1991, and
- organisation at the Group's Second Meeting of a topical discussion on brine, water, and gas sampling techniques and instrumentation - with presentations emphasising sampling of environmental tracers (as a follow-up to the workshop on flow heterogeneity and site evaluation).

Participants at the First Meeting of the Group considered it to have been extremely productive, and confirmed the mandate that had been established for it by the RWMC in January 1990 (reported in the previous issue of the Bulletin). The Second Meeting will be held in Helsinki, Finland, on 12-13 September 1991, immediately following the workshop on long-term observation of the geological environment.

Further information can be obtained from D.A. Galson of the NEA Secretariat.

NEA THERMOCHEMICAL DATA BASE PROJECT

The Thermochemical Data Base (TDB) Project, underway at the NEA Data Bank since 1983, has as its general objective to advance the level of understanding and prediction of radionuclide migration through geologic media. The Project consists of a compilation of fundamental thermodynamic data, and it is intended to make available a comprehensive, internally consistent, and internationally recognised and quality-assured chemical thermodynamic data base of generic application, and meeting in particular modelling requirements for the safety assessment of radioactive waste disposal systems. For selected key elements, the thermodynamic data available in the literature are reviewed by international groups of experts. The Radioactive Waste Management Committee has assigned a high priority to uranium, neptunium, plutonium, americium, and technetium. In addition, the Performance Assessment Advisory Group, at its last meeting, supported the initiation, within the TDB Project, of a critical review of the organic complexes of the actinides.

The final draft of the uranium review was issued in March 1990. The final publication, improved on the basis of the peer review recommendations, will be sent to the publisher at the end of March 1991. For technetium and americium, final draft reports for independent peer review are expected to be ready in June 1991 and October 1991, respectively. Review work on neptunium and plutonium was initiated in September 1990. If approved, review of the actinide complexes is planned to start in the course of 1991.

Further information can be obtained from H. Wanner or I. Forest of the NEA Data Bank.

NEA DATA BANK INDEX OF RADIOACTIVE WASTE MANAGEMENT COMPUTER PROGRAMS

Computer codes for geochemical modelling and transport of radionuclides in the geosphere are collected and verified at the NEA Data Bank. These codes have been fully tested, documented, and packaged as part of the Data Bank's normal procedure for code distribution, and are available on request. The program packages include the source program, sample problem(s) input and output, and reference report (input description). A list of radioactive waste management programs obtained by the Data Bank since the previous issue of the Bulletin appeared (June 1990) is provided below. The previous issue of the Bulletin contained a further list of 87 programs available as from the date of publication.

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- CHNSEED: hydrological sediment transfer in watershed
- DIGMAN: low-level radioactive spill or migration site sampling
- LINSEED: sediment transport for rectangular stream channel
- ORMONTE: uncertainty analysis for user-developed system models

**OPTRM/
WHTM:** hydrological model optimisation

RESRAD: near-field model for spent-fuel repository

RIPP2: user-friendly PC interface to geochemical code PHREEQE

SYVAC-D: risk assessment from underground radioactive waste disposal

TIME-2: radioactive waste disposal climatic change risk assessment

Requests for programs from the Data Bank may be made by letter, telex, or electronic mail. Activities of the Data Bank in this field are conducted in collaboration with the NEA Radiation Protection and Waste Management Division.

Further information can be obtained from E. Sartori of the NEA Data Bank.

OTHER INTERNATIONAL ACTIVITIES

AUTRES ACTIVITES INTERNATIONALES

INTRAVAL PROJECT

The fifth INTRAVAL workshop and the sixth Co-ordinating Group meeting were held in Cologne, Germany, in October 1990, with the Gesellschaft für Reaktorsicherheit (GRS) acting as host. The Cologne workshop included the last presentations of new modelling results of Phase I test cases, but the greater part of the meeting was dedicated to concluding the work performed in Phase I, and the launching of Phase II.

After the Co-ordinating Group meeting, K. Anderson (SKI) assumed the chairmanship of INTRAVAL in the place of A. Larsson (Kemakta Consultants Co.), who has left the chairmanship but will still be an active member of the Secretariat.

An information booklet on the INTRAVAL Project has been published by the NEA and SKI. The INTRAVAL Progress Report No. 6 was published in January 1991.

RESULTS OF PHASE I

Phase I of the INTRAVAL Project is comprised of seventeen test cases ranging from laboratory-scale experiments through field experiments on several different scales, as well as natural analogue studies. The multitude of test cases is explained by the fact that the participants represent twelve different countries planning for waste disposal in different media, such as crystalline rock, clay, rock salt, and unsaturated tuffaceous rocks. INTRAVAL also addresses a large range of spatial and temporal scales.

Most of the progress in Phase I of INTRAVAL has been made in the area of Process Identification. It has been demonstrated that experiments at different scales, flow rates, tracer concentrations, etc., are needed in order to distinguish unambiguously between the effects of different dispersion phenomena and matrix diffusion. It has also been demonstrated that statistical analysis forms an important part of the Process Identification step of validation. Although work remains to be done for the identification of processes active in specific systems, there are good prospects that Phase I of INTRAVAL will significantly increase the confidence in our ability to describe mathematically many of the processes believed to be of importance in radionuclide transport in a wide range of geological media.

The work has resulted in a number of ideas for further experiments or improved designs of already performed experiments, showing the importance of interaction between modellers and experimentalists. For example, the modeller can provide the experimentalist with perspectives on the various types of data needed, e.g., for distinguishing between different phenomena either directly or by analysing different suggested experimental set-ups.

The detailed results of INTRAVAL Phase I are now being documented in technical reports for each test case and in a summary report for the entire Phase. These reports are planned for publication during 1992.

The need for a continuation of INTRAVAL into a second phase (1991-1993) was foreseen at the start of the Project. Discussions were held at the last INTRAVAL meeting regarding the technical content of Phase II. In Phase II there will be more emphasis on validation efforts based on field studies and natural analogues. Four different working groups were established covering

- unsaturated flow cases (Las Cruces, Apache Leap, Twin Lake),
- hard rock (Finnsjön, Stripa, WIPP-2),
- salt (Gorleben, WIPP-1, Mol), and
- natural analogues (Alligator Rivers, Poços de Caldas).

The next INTRAVAL workshop, to be held in Seattle, WA, on 22-26 April 1991, will be the first of Phase II. It will be hosted by the U.S. Department of Energy.

Further information can be obtained from K. Andersson, SKI, Söhlstedtsgatan 11, Box 27106, S-102 52 Stockholm, Sweden [Tel: 46 (8) 729 7100, Tlx: 11961 SWEATOMS, Fax: 46 (8) 661 90 86], or from C. Thegerström of the NEA Secretariat.

INTERNATIONAL STRIPA PROJECT

Research into the disposal of radioactive wastes in fractured hard rock has been carried out at the former Stripa iron-ore mine in central Sweden under NEA sponsorship for more than ten years. The Project is managed by the Swedish Nuclear Fuel and Waste Management Company (SKB), under the direction of a Joint Technical Committee (JTC) with representatives from each of the participating countries as well as the OECD/NEA. The next meeting of the JTC will be held in Forsmark, Sweden, on 11-13 June 1991.

Phase III (1986-1991) of the Project enjoys the participation of seven countries (Canada, Finland, Japan, Sweden, Switzerland, the United Kingdom, and the United States), and includes work in three main areas:

- the development and improvement of site assessment methods and concepts (SAC subproject),
- characterisation of the Stripa granite and validation of concepts for groundwater flow and radionuclide transport through fractures (SCV subproject), and
- techniques and materials for the engineered sealing of possible groundwater flow paths through crystalline rock (sealing subproject).

The Project is now nearing completion: the SAC subproject is essentially complete; significant progress has been made in the SCV subproject; and all four large-scale in situ sealing experiments are in their final stages or have been completed. The main tasks through the end of 1991 will be detailed reporting of Project results. Some 70 technical reports are foreseen, to be followed by two overview reports in 1992. In addition, a final Symposium on the Project will be held in mid-1992 under joint SKB/NEA sponsorship.

Discussions are currently underway within the NEA framework on the possible establishment of a new project (unassociated with Stripa) at the international level dealing with in situ research matters.

Further information can be obtained from B. Stillborg, Stripa Project Manager, SKB, Box 5864, S-102 48 Stockholm, Sweden [Tel: 46 (8) 665 2804, Tlx: 13108 SKB, Fax: 46 (8) 661 5719], or from D. A. Galson of the NEA Secretariat.

INTERNATIONAL ALLIGATOR RIVERS ANALOGUE PROJECT

The International Alligators Rivers Analogue Project (ARAP), set up in 1987 under NEA sponsorship, completed its initial three-year programme on 30 August 1990. The participating organisations in Australia, Japan, Sweden, the United Kingdom, and the United States agreed at a Joint Technical Committee meeting in London on 28-29 June 1990 to a two-year extension.

This extension will provide a more extensive data base as input to a series of models of hydrology, geochemistry and radionuclide migration in the uranium deposit at Koongarra in the Northern Territory of Australia. The models are expected to be generic in nature and to be relevant to the processes expected to occur during the migration of radionuclides in water from radioactive waste repositories.

During the initial three-year period, a large amount of data were obtained from laboratory and field experiments focused on the Koongara deposit. Considerable progress was also made in developing research models to describe the hydrology, geochemistry and radionuclide migration. ARAP held major technical workshops in 1988 in Sydney and in Tucson, in 1989 in Sydney, and in 1990 at Harwell. The first major review report for 1988/89 was published in January 1990. Detailed technical data were published in quarterly reports provided to the participants and contractors during the three-year programme.

An additional technical workshop was held at Lucas Heights, Sydney, in December 1990 to review progress and plan the details of the ongoing experimental and modelling studies. This workshop was followed by a Joint Technical Committee meeting to review progress and to plan the programme for concluding the Project in 1993 with a series of major technical reports covering the following topics:

- **summary**
- **geology of the ore deposit**
- **geophysics and structural geology**
- **geomorphology**
- **hydrogeology - laboratory and field work**
- **hydrogeology - modelling**
- **groundwater chemistry**
- **rock characteristics**
- **rock-water interactions and alteration**
- **geochemical data bases**
- **speciation and solubility modelling**
- **formation of ore zones**
- **sorption**
- **radionuclide transport and relevance to performance assessment**
- **fission products and transuranics**
- **scenarios**
- **validation overview**

A small editorial committee will assist the ANSTO Project Manager in finalising these reports. The data from ARAP are also continuing to be modelled as Test Case 8 in the international model validation study, INTRAVAL. This will assist in applying the results of ARAP to several major national radioactive waste management programmes.

Further information can be obtained from P. Duerden, ANSTO, Private Mail Bag 1, Menai 2234, NSW, Australia, or from C. Thegerström of the NEA Secretariat.

NEA CO-OPERATIVE DECOMMISSIONING PROGRAMME EXTENDED

The first five-year phase (1985-1990) of the NEA Co-operative Programme for the Exchange of Scientific and Technical Information concerning Nuclear Installation Decommissioning Projects has been completed, and a second five-year phase has been initiated. A new decommissioning project by British Nuclear Fuels Ltd. raises the total number of projects in the Programme to 19. A report summarising results from the first five years of the Co-operative Programme is in the final stages of preparation, and will be published by the NEA in the course of this year.

Further information can be obtained from O. Ilari of the NEA Secretariat.

BIOMOVS

PHASE 2 BEING INITIATED

BIOMOVS (BIOsphere MOdel VAlidation STudy) was launched in 1985 and finalised at a symposium and workshop in Stockholm in October 1990 (discussed in detail later in this issue of the Bulletin). The scenarios considered in the first phase of BIOMOVS were relevant to a broad range of assessment issues, and the study has significantly enlarged our understanding of how radionuclides migrate and accumulate in the biosphere. A major conclusion from the study is that great care needs to be taken when selecting data for validation studies.

It is intended that Phase 2 of BIOMOVS should continue to foster the development of biosphere transport models, but with the added specific objective of exploring the feasibility of attaining consensus on the structure, conceptualisation and parameterisation of models for selected scenarios. The work for defining the framework of the second phase is now in progress and a document giving the scientific content and organisation of the study will be issued soon.

Further information can be obtained from G. Johansson, Swedish Radiation Protection Institute (SSI), Box 60204, S-104 01 Stockholm, Sweden [Tel: 46 (8) 729 7100, Tlx: 11771 SAFERAD, Fax: 46 (8) 727 7108].

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

ICRP REVISES BASIC RADIATION PROTECTION RECOMMENDATIONS

A major event in 1990 in the field of radiation protection was the conclusion of the three-year process of revision of the basic ICRP recommendations and the adoption by the Commission, in November 1990, of the new recommendations. This new version of the recommendations confirms the fundamental philosophy of the system of protection, as proposed by the ICRP in 1977, based on the three principles of justification of practices and interventions, optimisation of

protection, and limitation of individual risks. The new recommendations, however, introduce significant novelties and give the guidance a more rationalised and streamlined presentation than in the previous recommendations.

A principal novelty is the revision of the radiation risk factors for workers and members of the public based on new scientific and epidemiological evidence on the effects of the Hiroshima and Nagasaki nuclear explosions and the consequent introduction in the new recommendations of more stringent individual dose limits. This is not expected to have any significant impact on the requirements and costs of protection for members of the public, whose levels of exposure are already well below the dose limits, but it may have a significant impact on some segments of the nuclear industry where more efforts and costs will be needed to ensure that the exposures of certain critical group of workers, such as uranium miners and maintenance workers at nuclear power plants, are kept well below the new dose limits.

Another important novelty in the new recommendations is the attempt to introduce, although on a relatively preliminary and low profile, an integrated approach to the management of risks. This approach suggests that the general radiation protection philosophy, which has been so far applied only to the control of exposures which are certain to happen, as in normal operating conditions, and to the protection of persons once an accident has happened, should in reality apply to the prevention of all risks, irrespective of the probability of the events leading to an exposure. In other words, the ICRP now suggests that the general principles of the system of protection should be applied, in the design and operation of facilities, not only to limit doses to persons, but also to the prevention of risks associated with so-called probabilistic events, namely accidental events with probability less than one. This development in the ICRP thinking and guidance appears beneficial and relatively easy to apply in the case of small installations, but it may be extremely difficult to apply to large and complex nuclear installations and to some aspects of the long-term management of radioactive wastes.

The new ICRP recommendations have been deliberately drafted in general and scientific terms so that sufficient scope for interpretation and application is left to the users of the recommendations, particularly the national authorities. There is now a need for a conversion of the ICRP guidance into terms which are sufficiently practical and straightforward to facilitate their transfer into regulatory and operational practices at the national level. This will be the task of the international intergovernmental organisations, in particular through the revision of the Basic Safety Standards for Radiation Protection, jointly issued by the IAEA, NEA, WHO and ILO in 1982, and the revision of the Euratom Radiation Protection Directives, issued by the Commission of the European Communities in 1980. During the last months of 1990, the NEA already started, jointly with the IAEA, the preparatory work for the revision of the Basic Safety Standards, which is expected to be a complex and relatively lengthy process.

Further information can be obtained from O. Ilari of the NEA Secretariat.

INTERNATIONAL ATOMIC ENERGY AGENCY

SECOND MEETING OF INWAC

The Second Meeting of the International Radioactive Waste Management Advisory Committee (INWAC) was held in Vienna on 8-11 April 1991. INWAC was established in 1989 by the International Atomic Energy Agency to provide a forum for the exchange of information on generic radioactive waste management and disposal issues of international significance and to periodically review and provide advice on the Agency's radioactive waste management and disposal programme. The Second Meeting of INWAC was attended by 21 experts from 17 Member States and two international organisations. The experts provided status reports on radioactive waste management and disposal activities in their country and discussed issues of interest to the international community. Recommendations were also provided by INWAC on the Agency's medium-term plan (1992-1998 time frame) and the Agency's proposed radioactive waste management and disposal programme for the budget period 1993-1994.

Important recommendations and conclusions resulting from the meeting are noted below:

- INWAC endorsed the Agency's schedule and terms of reference of safety documents planned under Phase I of the Radioactive Waste Management Safety Standards (RADWASS) Programme. RADWASS is the highest priority programme in the Agency's waste management activities, and is recognised by Member States as an extremely important mechanism for achieving international consensus on the safe management and disposal of radioactive wastes.
- INWAC recognised the need for the establishment of a further international forum for the discussion and resolution of outstanding issues relating to criteria and principles for radioactive waste disposal. Such a group would provide an international environment for discussing new ideas and concepts related to waste disposal criteria, and would offer a means for reaching consensus on relevant parts of the RADWASS Programme.
- the Agency's Waste Management Advisory Programme (WAMAP) to developing Member States plays an important role in establishing the necessary waste management infrastructure in these countries. This Programme should be strengthened and additional resources committed to it to ensure its full utilisation.
- the Agency's proposed waste management programme for 1993/1994 was reviewed and found to be well-balanced.

INWAC recommendations will be forwarded to the Director-General of the IAEA and the Agency's Board of Governors for consideration.

Further information can be obtained from D.E. Saire, Waste Management Section, Division of Nuclear Fuel Cycle and Waste Management, International Atomic Energy Agency, P.O. Box 100, A-1400 Vienna, Austria [Tel: 43 (1) 2360 2674, Tlx: 112645, Fax: 43 (1) 234 564].

COMMISSION OF THE EUROPEAN COMMUNITIES

COMMUNITY R&D PROGRAMME ON RADIOACTIVE WASTE

Results of the 3rd programme 1985-1989 were presented at the 3rd Conference of the European Communities in Luxembourg (17-21 September 1990). The conference was attended by 400 participants from twenty countries. A complete picture of the state-of-the-art in the areas of radioactive waste treatment, storage, security, and regulation was provided, based on the multinational summary presentations. Proceedings of the conference will be available in mid-1991 (report EUR 13389 EN). The roundtable closing session, chaired by the Director-General of Directorate XII, stressed that the results obtained confirm the interest in deep geological disposal, which would be useful to support by a demonstration. These results equally provide an indispensable basis for the development of a European regulation on radioactive wastes.

The PACOMA Project, initiated during the 3rd R&D programme as a follow-up to the PAGIS Project, for the case of intermediate-level waste, has been completed. The conclusions of the study confirm those of PAGIS: the burial of alpha-emitting intermediate-level waste in geological formations (clay, granite or salt) can be done safely if the site is judiciously chosen and well characterised. The most notable difference in comparison with high-level waste is due to the presence of Iodine-129 which, owing to its mobility, can give rise to a relatively early peak dose (several thousands of years after repository closure). But in every case examined, the calculated doses were less than 0.1 mSv/a, frequently by several orders of magnitude. These results will be published in the course of 1991.

A call for research proposals, with a closing date of 30 May 1990, brought in more than 300 proposals for the 4th Community R&D programme 1990-1994. Budgetary constraints made the selection difficult. About 100 contracts will be initiated, representing a financial participation of the CEC of about 33 million ECU. To this should be added the Community participation in the underground projects at Asse (Germany) and Mol (Belgium) totalling 12 million ECU. A similar participation would be envisaged in French and English projects, on request.

COMMUNITY PLAN OF ACTION 1980-1992

A new series of reports, called EURADWASTE, has been created. They are concerned with the regulatory, administrative, and financial aspects of radioactive waste management. Four reports are available:

- No.1: Objectives, standards and criteria for radioactive waste disposal in the European Community - Report of a working group on "Joint elaboration of radioactive waste management policies" - Report EUR 12570 EN;
- No.2: Evaluation of storage and disposal costs for conditioned radioactive waste in several European countries - Report EUR 12871 EN;
- No.3: Radioactive waste equivalence - Report by a working group set up in the framework of the "Community plan of action in the field of radioactive waste" - Report EUR 12879 EN;

No.4: Quality assurance in the management of radioactive waste in the European Community
- Report by a working group set up in the framework of the "Community plan of action in the field of radioactive waste" - Report EUR 13069 EN.

3RD COMMUNITY PROGRAMME ON THE DECOMMISSIONING OF NUCLEAR INSTALLATIONS UNDERWAY

The 1989-1993 research programme on the decommissioning of nuclear installations is in progress, with a financial participation of the European Community of 31.5 million ECU. After a first call for proposals in 1989, 51 research proposals were selected. Currently, in addition to four pilot decommissioning projects (the BR-3 reactor at Mol, Belgium, the WAGR reactor at Windscale, United Kingdom, the KRB-A reactor at Gundremmingen, Germany, and the AT-1 fuel reprocessing facility at La Hague, France), most of the contracts have been signed and work is in progress. Subsequent to a supplemental budgetary contribution of 2.5 million ECU, decided at the end of 1990, a second call for proposals was published in the Official Journal in February 1991.

Further information on the above items can be obtained from S. Orlowski, Nuclear Fuel Cycle Division, Commission of the European Communities, Directorate-General XII, 200 rue de la Loi, B-1049 Brussels, Belgium [Tel: 32 (2) 235 4063, Tlx: 21877 COMEU B, Fax: 32 (2) 236 2006].

COMMISSION DES COMMUNAUTÉS EUROPÉENNES (CCE)

PROGRAMME R&D COMMUNAUTAIRE SUR LES DÉCHETS RADIOACTIFS

Les résultats du 3ème programme 1985-1989 ont été présentés lors de la 3ème Conférence des Communautés Européennes à Luxembourg (17-21 septembre 1990). La conférence a réuni environ 400 participants représentant une vingtaine de pays. Une image complète de l'état de l'art en matière de traitement, stockage, sécurité et réglementation des déchets radioactifs a été fournie, grâce à des présentations de synthèse, toutes multinationales. Les annales de la conférence seront disponibles mi-1991 (rapport EUR 13389 EN). La table ronde de clôture, présidée par le Directeur Général du Division XII, a souligné que les résultats obtenus confirment l'intérêt du stockage géologique profond, qu'il conviendrait de concrétiser par une démonstration. Ces résultats constituent également un apport prénormatif indispensable au développement d'une réglementation européenne sur les déchets nucléaires.

Le projet PACOMA, commencé lors du programme ci-dessus, et qui complète le projet PAGIS pour le cas des déchets de moyenne activité, est achevé. Les conclusions de l'étude confirment celles de PAGIS: l'enfouissement de déchets de moyenne activité et contenant des émetteurs alpha dans des formations géologiques (argile, granite ou sel) peut être effectué avec sûreté si le site a été judicieusement choisi et bien caractérisé. La différence la plus notable par rapport aux déchets de haute activité est due à la présence de l'Iode-129 qui, étant donné sa

rapport aux déchets de haute activité est due à la présence de l'Iode-129 qui, étant donné sa mobilité, peut être responsable d'une pointe de dose assez rapprochée (quelques milliers d'années après la clôture du dépôt). Mais dans tous les cas examinés, les débits de doses calculées sont inférieurs à 0,1 mSv/a, le plus souvent de plusieurs ordres de grandeur. Ces résultats seront publiés dans le courant de 1991.

Un appel de propositions de recherche, clôturé le 30 mai 1990, a apporté plus de 300 propositions d'étude pour le 4ème programme communautaire 1990-1994. Après une sélection rendue sévère par les contraintes budgétaires, une centaine de contrats vont être mis en oeuvre représentant une participation financière de la CEE de 33 M.ECU environ. S'ajoute la participation de la Communauté aux projets souterrains à Asse (Allemagne) et à Mol (Belgique) pour un montant global de 12 M.ECU. Des participations similaires à des projets français et anglais seraient envisagés sur demande.

PLAN D'ACTION COMMUNAUTAIRE 1980-1992

Une nouvelle série de rapports, appelées EURADWASTE, a été créée. Elle concerne exclusivement les aspects réglementaires, administratifs et financiers de la gestion des déchets radioactifs. Les rapports ci-après sont disponibles:

- No 1: Objectives, standards and criteria for radioactive waste disposal in the European Community - Report of a working group on "Joint elaboration of radioactive waste management policies" - Report EUR 12570 EN;
- No 2: Evaluation of storage and disposal costs for conditioned radioactive waste in several European countries - Report EUR 12871 EN;
- No 3: Radioactive waste equivalence - Report by a working group set up in the framework of the "Community plan of action in the field of radioactive waste" - Report EUR 12879 EN;
- No 4: Quality assurance in the management of radioactive waste in the European Community - Report by a working group set up in the framework of the "Community plan of action in the field of radioactive waste" - Report EUR 13069 EN.

3ÈME PROGRAMME COMMUNAUTAIRE SUR LE DÉCLASSEMENT DES INSTALLATIONS NUCLÉAIRES EN PHASE D'EXÉCUTION

Le programme de recherche 1989-1993 sur le déclasserment des installations nucléaires, doté d'une participation budgétaire de la Communauté Européenne de 31,5 M.ECU, est en cours d'exécution. A la suite d'un premier appel de propositions en 1989, 51 propositions de recherche ont été sélectionnées. Actuellement, en plus de quatre projets de démantèlement pilotes (le réacteur BR-3 à Mol (Belgique), le réacteur WAGR à Windscale (Royaume-Uni), le réacteur KRB-A à Gundremmingen (Allemagne) et l'atelier de retraitement de combustible AT-1 à La

A la suite d'une attribution de budget supplémentaire de 2,5 M.ECU décidée fin 1990, un deuxième appel de propositions a été publié au Journal Officiel en février 1991.

Pour plus de renseignements, prendre contact avec S. Orłowski, Division Cycle du Combustible Nucléaire, Commission des Communautés Européennes, Direction Générale XII, rue de la Loi 200, B-1049 Bruxelles, Belgique [Tel: 32 (2) 235 4063, Tlx: 21877 COMEU B, Fax: 32 (2) 236 2006].

WASTE MANAGEMENT MEETINGS

UPCOMING MEETINGS

REUNIONS DANS LE DOMAINE DE LA GESTION DES DECHETS RADIOACTIFS

FUTURES REUNIONS

NEA WORKSHOP ON GAS GENERATION AND RELEASE FROM RADIOACTIVE WASTE REPOSITORIES

This workshop is being organised by the NEA under the joint auspices of the Performance Assessment Advisory Group (PAAG) and the Co-ordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal (SEDE). It will be held in Aix-en-Provence, France, on 23-26 September 1991.

The potential importance of gas generation in repositories was first noted in an NEA workshop (1987) on near-field assessment of repositories for low- and intermediate-level radioactive waste. Since then, increasing attention has been given to studies on the amount and rates of gas generation and the influence of gas pressure build-up and transport in and around the repository. There is broad agreement that gas will be generated in radioactive waste repositories owing to corrosion of steel, microbial degradation of organic materials, and, to a lesser extent, radiolytic decomposition of water and organic materials. But the extent to which gas generation and gas release have to be taken into account in the planning, design, and safety assessment of radioactive waste repositories is still unclear.

The objectives of the workshop are threefold:

- to give Member countries an opportunity to exchange recent information in this area,
- to assess at an international level the significance of gas generation and release from radioactive waste repositories, and
- to identify future needs in this area.

The workshop will focus on the problems associated with the generation, release and transport of gases in the different types of waste and host rock of radioactive waste repositories. It will encompass modelling and experiments on the relevant gas sources and generation processes, the transport of gases in repositories, diffusion and migration in the near field and far field, two-phase flow, etc.

Participants in the workshop should be specialists in the subject areas defined by the scope of the workshop, should be actively involved in relevant theoretical or experimental research activities, and should be qualified to contribute actively to the discussions. Nominations of participants should be submitted through national representatives to the PAAG and/or the SEDE Co-ordinating Group, so as to be received by the NEA Secretariat by 10 July 1991.

The workshop will be composed of five sessions and additional informal mini-workshops for detailed discussion of selected topics. Sessions II-IV will be divided into subsessions on (i) modelling aspects and (ii) experimental aspects.

Session I: Opening Session

Session I will provide a general overview and perspective on gas generation and release from radioactive waste repositories. It will include invited papers covering the overall aspects of gas generation and gas release for low- and intermediate-level waste repositories and for high-level waste repositories, respectively. An additional invited paper will focus on the Waste Isolation Pilot Plant (WIPP) Project in the United States.

Session II: Gas Generation

Session II will be devoted to work on the mechanisms, rates and supporting experiments of gas generation in radioactive waste repositories.

Session III: Near-Field Effects of Gas Release

Session III will be devoted to studies of near-field phenomena, and recent advances made to improve understanding of the role of gas on the physico-chemical environments which determine the migration behaviour of radionuclides, the implications of waste degradation on the physical integrity of the repository, etc.

Session IV: Far-Field Effects of Gas Migration

Session IV will be devoted to studies of migration of gases in the geosphere, such as studies on conductivities and diffusivities in the host rocks.

Session V: Panel Discussion

Additional mini-Workshops for Detailed Technical Discussions of Selected Topics

Further information can be obtained from H. L. Chang of the NEA Secretariat.

NEA WORKSHOP ON LONG-TERM OBSERVATION OF THE GEOLOGICAL ENVIRONMENT: NEEDS AND TECHNIQUES SEDE - 91

This second SEDE workshop will be held in Helsinki, Finland, at the invitation of the Finnish Industrial Power Company Ltd. (TVO). The workshop will be held on 9-11 September 1991, to include two full days of technical discussion and one full day for a field trip to the island of Olkiluoto, location of (i) the Finnish repository for low- and intermediate-level wastes (L/ILW), under construction, and (ii) a potential disposal site for high-level waste (HLW), under preliminary investigation. The workshop will be followed by the Second Meeting of the SEDE Co-ordinating Group on 12-13 September 1991.

In the process of implementing deep geological disposal systems for radioactive wastes, long-term observations of the geological environment will be required for at least three reasons:

- to support prelicensing performance assessment and model validation studies,
- to support engineering design for repository development, and
- to confirm that repository construction and operation have not caused actual site conditions to deviate from the limits assumed in the licensing review.

For geological disposal systems, the process of excavating access shafts to a repository, and the tunnels and silos themselves, provides an excellent opportunity to test groundwater flow models and verify conceptual models of other aspects of the site (such as seismicity and rock stress distributions) by means of long-term observation programmes. These programmes need to be thought out and designed well in advance of any construction work, as boreholes need to be drilled and instrumented, and a background data base established, possibly over a number of years. In addition, implementation of observation networks within the excavations has a potentially significant impact on the pace of construction work, and this needs to be planned in advance. Thus, this is a topic of crucial importance in repository development programmes, but a topic which has been largely ignored to date at international level.

The workshop will have several objectives:

- to review in detail the needs for long-term observations of the geological environment in the context of national programmes for the development of deep geological repositories for radioactive waste,
- to exchange information on the design of long-term observation networks, and
- to assess the techniques and instrumentation available for conducting such long-term observation programmes, with a view to providing recommendations on instrument development needs.

The workshop will consider those measurement programmes undertaken as part of site characterisation in the preconstruction phase of deep repositories, where the intent is to proceed

with these measurements into the construction and operational period for the purpose of long-term observation of the geological environment or performance confirmation. Such long-term observation programmes are expected to be continued at least until permanent closure of the repository and will be designed to measure both man-made perturbations (e.g., site characterisation tests) as well as natural processes and events (e.g., seismic activity).

In particular, the workshop will consider which parameters might be appropriate to measure over long periods, how the data could be used in model or concept verification, the design of such long-term observation programmes (e.g., location and number of observation points, frequency of observations), and the design of instruments for long-term observation programmes. The needs and techniques for long-term observation of the geological environment will be considered for deep repositories for all types of radioactive wastes. Long-term observation programmes may be specific to the host geological environment and, therefore, it is the intent of the workshop to review needs and techniques for the major host environments under consideration in NEA Member countries: fractured hard rock, salt, clay, and unsaturated tuff.

The workshop will provide a forum for discussion between scientific experts concerned with development of long-term observation programmes for different host environments. The results of the workshop will also be of interest to those responsible for overall implementation of site characterisation programmes, and for setting priorities in research programmes. Participants should be specialists in the subject areas defined by the scope of the workshop, should be actively involved in relevant research, operational, or regulatory activities, and should be qualified to contribute actively to the discussions. Nominations of participants should be submitted by national representatives to the SEDE Co-ordinating Group, so as to be received by the NEA Secretariat by 1 July 1991. Participation at the workshop will be restricted to ensure a total participation of about 50 scientists. Thus, participation is limited to speakers, those contributing poster papers accepted for inclusion in the workshop, and members of the SEDE Co-ordinating Group or their representatives. In addition, SEDE members who are authors of papers are invited to send one additional national representative. Exceptions to these restrictions will only be possible through prior arrangement with the NEA Secretariat.

The workshop will be composed of a small number of invited review papers and discussion. In addition, up to 15 poster presentations on related or supporting work will be accepted. The provisional programme of the workshop has been structured as follows:

Session I: Context and Programmatic Implications of Long-Term Observation Needs

Four invited papers will be presented, one each on fractured hard rock, salt, clay, and unsaturated tuff. These papers will show how long-term observation programmes fit into the general framework of repository development programmes for the different potential host geological environments.

Session II: Hydrogeology, Hydrochemistry, and Rock-Fluid Interactions

Three invited papers will be presented, reviewing which parameters need to be measured, the design of field programmes to obtain the necessary data, and instrumentation availability and development needs, particularly with respect to longevity and durability requirements. Papers will highlight possible differences between fractured hard rock, unsaturated tuff, and sedimentary

formations. Papers will address needs, methods, instrumentation, data interpretation, and the rationale for each.

Session III: Geomechanics and Tectonics

As for Session II, except that only two invited papers will be presented.

Session IV: Regulatory Perspective

No formal papers will be requested for oral presentation during this Session. Rather, several representatives of regulatory agencies will be asked to provide their perspective on what they have heard presented and discussed in the previous three Sessions. These relatively brief and informal introductory presentations will be followed by a general discussion, in which conclusions and recommendations from the workshop will be emphasised.

Further information can be obtained from D.A. Galson of the NEA Secretariat.

NEA SORPTION WORKSHOP 91

A workshop on radionuclide sorption as it is represented in performance assessment models will be held from 14-18 October 1991 in Interlaken, Switzerland, at the invitation of the Swiss National Co-operative for the Storage of Radioactive Wastes (NAGRA). The workshop is being organised under the auspices of the Performance Assessment Advisory Group (PAAG). Only invited papers will be presented. Participation will be limited to speakers and specialists who can actively contribute to the debate. Nominations must be made through national representatives to PAAG.

The workshop will have several objectives:

- to evaluate the way sorption processes are incorporated in performance assessment models,
- to document the current status of application of sorption processes,
- to identify open issues of high priority, and
- to propose future activities to resolve these issues.

The workshop should also assess the need and desirability of future co-operative efforts to produce new data. The workshop will consist of two parts.

Part I - Sorption Intercalibration Exercise, 14-15 October 1991

Participants in the 1989 Sorption Intercalibration Exercise will compare their results, identify strengths and weaknesses of the exercise, and discuss the implications for performance

assessment. A summary and a position paper will be prepared for presentation in Part II of the workshop.

Part II - Sorption Data Base Comparison and Acquisition of Data, 16-18 October 1991

Part II will be divided into four sessions:

Session I: Comparison of Data Bases used in Performance Assessment Studies

Session I will focus on the presentation and discussion of the existing sorption data bases used in the performance assessments of various national programmes. For each data base reviewed, the source of the data will be identified (i.e., specific laboratory data, literature, field data, analogue data), and the reference conditions for the data base will be specified (i.e. site-specific conditions, such as rock, water chemistry, and nuclide concentrations). It will also be noted if the data base presented is generic or site specific, and if it is intended to be "realistic" or "conservative". The review will also examine the data bases for consistency and inconsistency, and identify gaps in sorption data.

This Session will also include a presentation on the experience in using OECD/NEA Sorption Data Base (SDB).

Session II: Strategy to Develop Data Bases

Session II will focus on the methodologies (and the judgements implied) used to select and derive the sorption data of various performance assessments. The goal of this Session will be to describe and discuss these methodologies, and the justifications for application of these data. The Session will conclude with the formulation of a position paper.

Topics of discussion will include appropriate sampling, static laboratory techniques, data reduction methods to provide K_ds, isotherms, or sorption probability distribution functions, justification of data used at relevant spatial and temporal scales with thermodynamic arguments, dynamic laboratory or field experiments, and natural analogue studies.

Session III: Experimental Techniques

Session III will focus on the role of laboratory work and should provide guidance as to the direction of future laboratory research. It will include a summary of the results and conclusions of the Intercalibration Exercise. Additional papers will focus on specific experimental approaches. Sorption on pure minerals and the need to control key variable parameters, such as pH, Eh, temperature and pressure, will be discussed. This Session will also include the formulation of a position paper.

Session IV: Final Consensus and Position Paper

Session IV will summarise the workshop, develop a consensus on the applicability of sorption data to performance assessments, recommend future activities in the field of sorption,

and identify for the Member countries possible areas of co-operation between national waste management programmes.

Further information can be obtained from B. Rügger of the NEA Secretariat.

WASTE MANAGEMENT MEETINGS

PAST MEETINGS

REUNIONS DANS LE DOMAINE DE LA GESTION DES DECHETS RADIOACTIFS

REUNIONS PASSEES

NEA WORKSHOP ON HETEROGENEITY OF GROUNDWATER FLOW AND SITE EVALUATION (SEDE-90)

This workshop was concerned with the methodologies for the investigation and interpretation of spatial variability and heterogeneity of groundwater flow systems, in the context of national site evaluation programmes. It was organised under the auspices of the NEA Co-ordinating Group on Site Evaluation and Design of Experiments for Radioactive Waste Disposal (SEDE), and was held in Paris on 22-24 October 1990. The workshop was designed to focus discussions on the strategies and capabilities to obtain the understanding and data required for hydrogeological modelling for safety assessments, as well as on the adequacy and appropriateness of the modelling techniques.

Some 23 technical presentations were given, and the workshop was attended by about 60 scientists. An attempt was made to encourage interaction and discussion between those involved in modelling work and those involved in designing and conducting both regional-scale and small-scale field investigations. Emerging from the presentations, six issues were brought forward for discussion in greater detail in the closing session:

- improvement in methods to investigate spatial variability and heterogeneity of groundwater flow systems over the past decade,
- use of different methods for quantifying uncertainty arising from spatial variability of hydrological data,
- problems associated with deriving simplified groundwater flow models for performance assessment from more detailed research models.
- the problem that hydrological testing provided data on a relatively small scale compared to the larger-scale requirements of regional groundwater flow modelling,
- the issue of dealing with uncertainty in conceptual models for groundwater flow, and
- uncertainties in groundwater transport (as opposed to flow) models.

Proceedings of this workshop will be published by the NEA within the next few months. These proceedings will reproduce the 23 technical presentations, and will include a summary of the discussions.

Further information can be obtained from D.A. Galson of the NEA Secretariat.

NEA WORKSHOP ON RADIATION PROTECTION AND SAFETY CRITERIA FOR THE DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE

This workshop was organised under the joint auspices of the NEA Committees on Radiation Protection and Public Health (CRPPH) and on Radioactive Waste Management (RWMC). It was held in Paris on 5-7 November 1990. The scope of the workshop was limited to radiation protection and safety criteria regarding the postclosure phase of deep geological disposal of high-level radioactive waste. The objective was to provide an up-to-date review of the state of development in this area through information exchange and discussion of existing and proposed international and national safety criteria, including the conceptual basis and approaches to their practical application.

Some 35 experts, representing nuclear regulatory and radiation protection authorities, as well as radioactive waste management agencies from most countries with nuclear power programmes, attended the workshop. National presentations describing the regulatory background and the existing or planned criteria for the disposal of high-level waste were made and constituted the basis for the discussion of topical issues. The emphasis was placed on criteria and the demonstration of compliance. Issues such as waste retrievability, postclosure monitoring and institutional control measures (i.e., markers and records) were excluded from the discussions.

In discussing the "safety case", the participants examined the translation of radiation protection principles into measures of performance and/or acceptability to protect humans and the environment. The use of dose and risk concepts was reviewed, with the view that both concepts are valid indicators of safety but have limits attached to them. Collective dose assessments and ALARA were also discussed, as were other possible indicators of long-term performance, such as natural background radiation and release rates of natural radionuclides from the geosphere to the biosphere. As far as compliance is concerned, reliance on subsystem requirements (i.e., container lifetime), the use of quantitative vs. qualitative evidence, and other specific issues, such as how to tackle human intrusion risks and biosphere modelling in the far future, were examined.

The major discussions and conclusions of the meeting, together with the national background papers, will be published by the NEA in the second part of 1991, after review by the CRPPH and the RWMC at their respective meetings in June 1991.

Further information can be obtained from J.-P. Olivier of the NEA Secretariat.

BIOMOVS SYMPOSIUM AND WORKSHOP

On behalf of the BIOMOVS group, the Swedish Radiation Protection Institute (SSI) organised in Stockholm, Sweden, on 8-12 October 1990, an international symposium, followed by a workshop, on the validity of environmental transfer models. The purpose of the meeting was to summarise the results of the five-year BIOMOVS programme, and to identify possible future work in the area of biosphere model validation. The meeting was attended by approximately 100 experts from 18 countries, the CEC, the IAEA, and the NEA.

BIOMOVS, the BIosphere MOdel Validation Study, was initiated in 1985 by the SSI in Sweden. There were three main objectives:

- to test the accuracy of the predictions of environmental assessment models for selected contaminants and exposure scenarios,
- to explain differences in model predictions owing to structural deficiencies, invalid assumptions and/or differences in selected input data, and
- to recommend priorities for future research to improve the accuracy of model predictions.

A secondary objective was to act as a forum for the exchange of ideas, experience and information in order to improve the confidence with which the environmental behaviour of trace substances in the biosphere can be assessed quantitatively.

The symposium included sessions for transfer of radionuclides and trace elements in agricultural ecosystems, in nonagricultural ecosystems, in aquatic systems, reliability of model predictions for longer periods, overview of international studies in the field of biosphere modelling, and conclusions and lessons learned.

It was obvious from the discussions at the symposium that the study had been very useful and appreciated by the participants. It was stressed that the study had demonstrated the potential for large uncertainties to be associated with any prediction made using environmental transfer models. Confidence in model predictions was highest for well-studied radionuclides and pathways, e.g., the forage-cow-milk-pathway for Iodine-131 and Caesium-137. In these cases, uncertainties were usually well within one order of magnitude. For less well-studied nuclides of chemical elements with complex properties and for releases of long-lived nuclides into the far future, the uncertainties were considered to be much larger than one order of magnitude.

Another conclusion highlighted at the symposium was that the problem for which a model prediction is to be given must be carefully and completely described; otherwise, discrepancies due to interpretation and the selection of model and parameter values will dominate the overall uncertainty. A further conclusion from the study stressed at the symposium was that the methodology for uncertainty analysis of environmental assessments should be standardised, so that appropriate comparisons can be made and decisions taken on a uniform basis.

The symposium was followed by a workshop to explore the interest of continuing BIOMOVS in a phase 2. Many participants expressed a desire to continue BIOMOVS and it seems likely that phase 2 will start with financial support from several countries. The details remain to be worked out. A discussion was also held on possible items to include in phase 2, in which it was proposed

- to develop a reference (standard) biosphere model for the purpose of performance assessment of radioactive waste repositories,
- to continue the work on uncertainties involved in assessment methods, in particular related to the mathematics used in model development,
- to study models for the environmental transfer of some long-lived radionuclides, like Carbon-14, Tritium and Iodine-127, and
- to test the accuracy of models for the urban environment.

There was also some consensus on the need to look at the endpoints of various calculations and, in particular, the interface between the geosphere and biosphere in relation to model predictions. Consistent assumptions need to be applied in various models.

It will now be up to the main parties involved in BIOMOVS to make a formal proposal for phase 2, which was proposed to start during Spring 1991. Full proceedings of the meeting will be published by the SSI in due course.

Further information can be obtained from G. Johansson, Swedish Radiation Protection Institute (SSI), Box 60204, S-104 01 Stockholm, Sweden [Tel: 46 (8) 729 7100, Tlx: 11771 SAFERAD, Fax: 46 (8) 33 05 31], or from C. Viktorsson of the NEA Secretariat.

NEA/SKI GEOVAL-90 SYMPOSIUM

This symposium was concerned with the validation of models used in safety assessments of repositories for the final disposal of radioactive wastes. It was jointly organised by the Swedish Nuclear Power Inspectorate (SKI) and the NEA, and was held in Stockholm, Sweden, on 14-17 May 1990. The main objectives of GEOVAL-90 were to review the progress made during the last three years (subsequent to the GEOVAL-87 Symposium) on the validation of models describing groundwater flow and radionuclide transport through the geosphere, to review plans for future work, and to discuss validation strategies in the context of nuclear waste disposal programmes, regulatory requirements and scientific progress. Attention was also given to the validation of geochemical models, coupled therm-hydro-mechanical models, and fracture-flow models.

Sixty-five oral and poster presentations were made at the symposium, which was attended by some 170 participants representing 18 countries and 3 international organisations. During the symposium, attention was drawn, inter alia, to

- progress in validation and in the development of systematic procedures for validation made since the GEOVAL-87 Symposium, and to the achievements of the INTRAVAL Project in particular,
- the need to extend validation work in specific areas, such as channelling, matrix diffusion, and coupled thermal-mechanical effects on geosphere flow and transport properties,
- the need for critical and extensive dialogue between performance assessment modellers and scientists studying the basic processes that feed into the performance assessment models, and between disposal system implementors and regulators, and
- the need to obtain site-specific data in order to make significant further progress in the area of validation and, more generally, in the area of safety assessment.

Proceedings of the symposium were published by the NEA in early 1991. The proceedings contain the full set of 65 papers, plus a transcript of the closing panel discussion.

Further information can be obtained from J. Andersson, SKI, Söhlstedtsgränd 11, Box 27 106, S-102 52 Stockholm, Sweden [Tel: 46 (8) 729 71 00, Tlx: 11961 SWEATOMS, Fax: 46 (8) 661 90 86], or from C. Thegerström or D.A. Galson of the NEA Secretariat.

NEA AD HOC MEETING ON ENVIRONMENTAL RESTORATION AND WASTE MINIMISATION

This meeting was organised under the auspices of the NEA Radioactive Waste Management Committee (RWMC), upon proposal by the Office of Environmental Restoration and Waste Management of the United States Department of Energy (USDOE/EM). The meeting was held in Paris on 12-13 March 1991, and was attended by 22 participants coming from nine OECD/NEA Member countries, the CEC, the OECD Environment Directorate, and the NEA Secretariat. This meeting was considered as exploratory, and had, therefore, a broad scope, encompassing discussion of current efforts and needs in the areas of environmental restoration and waste minimisation for mixed radioactive and chemically toxic wastes. This was the first meeting organised at international level that has been specifically devoted to environmental problems associated with these so-called "mixed wastes".

The meeting had four objectives:

- to establish an awareness among NEA Member countries of hazardous environmental situations requiring remediation and the technologies available or being developed for remediation,
- to provide cognizance of the agencies and responsibilities within each country, as well as the appropriate contact individuals for initiating international co-operation,

- to provide cognizance of activities to minimise or to eliminate hazardous materials by substitution, recycling, or reuse of materials destined to become hazardous waste, or by in-plant treatment to destroy hazardous materials, and
- to recommend, if appropriate, a specific programme of NEA co-operative activities in this area.

Several broad conclusions arose from the meeting. First, the participants recognised the problems related to the presence of chemically toxic material in various radioactive wastes. It was realised that these problems are becoming increasingly apparent in a number of countries, particularly in the United States, and that actions are being implemented to reduce the generation of such wastes and to remediate the effects of past practices. It was also realised that wastes containing both radiotoxic and chemically toxic material, i.e., "mixed wastes", can be encompassed by existing definitions of waste categories.

Second, the participants recommended that the RWMC, in co-operation with other relevant international bodies, consider establishing a programme dealing with mixed-waste issues, in order to facilitate international exchanges of information, experience and technology, and in order to assess the problem with regard to past situations and practices and possible future policies. International exchanges of information, experience and technology might occur on topics such as

- establishment of an inventory of relevant regulatory criteria,
- ways to reduce the problem at the source,
- the characterisation, minimisation, handling, treatment and disposal of mixed wastes,
- the characterisation, minimisation, retrieval, remediation, and monitoring of contaminated groundwater and soils, and
- compliance assessment issues.

Third, the participants recommended that the RWMC consider sponsoring or cosponsoring a workshop within the next 18 months to assess the status of needs and to formulate a programme at an international level.

The conclusions and recommendations from this meeting will be taken up for discussion at the June 1991 meeting of the RWMC.

Further information can be obtained from J.-P. Olivier of the NEA Secretariat.

BOOKS PUBLISHED

PUBLICATIONS

RECENT OECD/NEA WASTE MANAGEMENT PUBLICATIONS

The International Probabilistic System Assessment Group - Background and Results, 31 pages, 1991, available free-of-charge on request.

In 1985, the NEA Radioactive Waste Management Committee set up the Probabilistic System Assessment Code (PSAC) User Group in order to help co-ordinate the development of probabilistic system assessment codes for radioactive waste disposal in the Member countries. The activities of the Group include exchange of information, code and experience, discussion of relevant technical issues, and the conduct of code comparison (PSACOIN) exercises designed to build confidence in the correct operation of these tools for safety assessment. The Group is now known simply as the Probabilistic System Assessment Group (PSAG).

This report has been prepared to inform interested parties, beyond the group of specialists directly involved, about probabilistic system assessment techniques as used for performance assessment of waste disposal systems, and to give a summary of the objectives and achievements of PSAG.

PSACOIN Level 1a Intercomparison (An International Code Intercomparison Exercise on a Hypothetical Safety Assessment Case Study for Radioactive Waste Disposal Systems), NEA Probabilistic System Assessment Code (PSAC) User Group, edited by A. Nies, D.A. Galson, J.-M. Laurens, and S. Webster, 116 pages, 1990, available free-of-charge on request.

This report describes an international code intercomparison exercise conducted by the NEA Probabilistic System Assessment Code (PSAC) User Group. The PSACOIN Level 1a exercise is the third of a series designed to contribute to the verification of probabilistic codes that may be used in assessing the safety of radioactive waste disposal systems or concepts. Level 1a is based on a more realistic system model than that used in the two previous exercises, and involves deep geological disposal concepts with a relatively complex structure of the repository vault. The report compares results and draws conclusions with regard to the use of different modelling approaches and the possible importance to safety of various processes within and around a deep geological repository. In particular, the relative significance of model uncertainty and data variability is discussed.

Disposal of Radioactive Wastes: Can Long-Term Safety be Evaluated? - An International Collective Opinion, 24 pages, 1991, available free-of-charge on request.

This report presents a collective opinion of the Radioactive Waste Management Committee of the OECD Nuclear Energy Agency (OECD/NEA) and of the International Radioactive Waste Management Advisory Committee of the International Atomic Energy Agency (IAEA) on the methodology and means for assessing the safety of radioactive waste disposal practices and concepts. It has been endorsed by the Experts for the Community Plan of Action in the Field of Radioactive Waste Management of the Commission of the European Communities (CEC).

Évacuation des Déchets Radioactifs: Peut-On Évaluer la Sûreté à Long Terme? - Une Opinion Collective Internationale, 24 pages, 1991, disponible gratuitement sur demande.

Le présent rapport expose l'opinion collective du Comité de la gestion des déchets radioactifs de l'Agence de l'OCDE pour l'Energie Nucléaire (OCDE/AEN) et du Comité consultatif international de l'Agence Internationale de l'Energie Atomique (AIEA) sur la gestion des déchets radioactifs au sujet de la méthodologie et des moyens permettant d'analyser la sûreté des pratiques et concepts d'évacuation des déchets radioactifs. Cette Opinion a été entérinée par les experts de la Commission des Communautés Européennes (CCE) chargés du Plan d'action de la Communauté dans le domaine de la gestion des déchets radioactifs.

The International IntraVal Project - Background and Results, 45 pages, 1990, available free-of-charge on request.

INTRAVAL is an international project concerned with the use of mathematical models for predicting the transport of radioactive substances in the geosphere. Such models are used to help assess the long-term safety of radioactive waste disposal systems. The INTRAVAL Project was established to evaluate the validity of these models. Results from a set of selected laboratory and field experiments, as well as studies of occurrences of radioactive substances in nature (natural analogues), are compared in a systematic way with model predictions. Discrepancies between observations and predictions are discussed and analysed.

This report was prepared to provide interested parties beyond the group of directly involved specialists with a general background to the INTRAVAL Project and a summary of the objectives and achievements of INTRAVAL.

Le Projet International INTRAVAL - Informations Générales et Résultats, 45 pages, 1990, disponible gratuitement sur demande.

INTRAVAL est un projet international concernant l'utilisation de modèles mathématiques pour prévoir le transport potentiel de substances radioactives dans la géosphère. Ces modèles contribuent à évaluer la sûreté à long terme des systèmes d'évacuation des déchets radioactifs. Le projet INTRAVAL est destiné à apprécier la validité de ces modèles. Il consiste à comparer de façon systématique les résultats d'une série d'expériences de laboratoire et in situ ainsi que d'études sur la présence de substances radioactives dans la nature (analogues naturels) avec les prévisions établies à l'aide des modèles. Les écarts constatés entre les valeurs observées et les valeurs prévues sont ensuite examinés et analysés.

Le présent rapport s'adresse à tous ceux qui s'intéressent au projet INTRAVAL sans y participer directement. Il en donne une description générale, en résume les objectifs et en présente les résultats.

Validation of Geosphere Flow and Transport Models (GEOVAL) (Proceedings of an NEA/SKI Symposium, Stockholm, Sweden, 14-17 May 1990), 668 pages, 1991, FFr 420.

It is planned to dispose of high-level radioactive wastes in deep geological formations. To assess the long-term safety of radioactive waste disposal systems, mathematical models are used to describe groundwater flow, chemistry and potential radionuclide migration through these formations. Establishing the validity of such models is important in order to obtain the necessary confidence in the safety of the disposal method. The papers in these proceedings of the GEOVAL-90 Symposium describe the current state of knowledge on the validation of geosphere flow and transport models.

Validation des modèles d'écoulement et de transport dans la géosphère (GEOVAL) (Compte rendu d'un Symposium AEN/SKI, Stockholm, Suède, 14-17 mai 1990), 668 pages, 1991, FFr 420.

Il est prévu d'évacuer les déchets de haute activité dans des formations géologiques profondes. Pour évaluer la sûreté à long terme des systèmes d'évacuation de déchets radioactifs, on a recours à des modèles mathématiques décrivant les écoulements d'eaux souterraines, la chimie et la migration éventuelle des radionuclides dans les formations géologiques. Il est important d'être en mesure de vérifier la validité de ces modèles pour obtenir un degré de confiance approprié dans la sûreté des méthodes d'évacuation. Les exposés reproduits dans ce compte rendu du Symposium GEOVAL-90 font état des connaissances actuelles en matière de validation des modèles d'écoulement et de transport dans la géosphère.

Co-ordinated Research and Environmental Surveillance Programme related to Sea Disposal of Radioactive Waste: CRESP Activity Report 1986-1990, 152 pages, 1990, available free-of-charge on request.

The Co-ordinated Research and Environmental Surveillance Programme relevant to sea disposal of radioactive waste (CRESP) was created in 1981 in the framework of the 1977 Decision of the OECD Council establishing a Multilateral Consultation and Surveillance Mechanism for Sea Dumping of Radioactive Waste. The main task of CRESP was to set up a site-specific scientific research programme to increase current knowledge of the processes controlling the transfer of radionuclides in the marine environment, so that impact of past dumping could be monitored and future assessments could be based on more accurate and comprehensive scientific data. The CRESP mandate was extended in 1987 to respond to a request from the Paris Commission to include consideration of radioactive discharges in the maritime area covered by the Convention on the Prevention of Marine Pollution from Land-Based Sources.

This report summarises the CRESP activities carried out during the 1986-1990 five-year phase. Concerning the review of deep sea results, the report relates progress achieved beyond

the level of knowledge which was available when the first phase of the CRESP programme was decided and which was taken into account in the 1985 Site Suitability Review. With respect to coastal discharges, it presents a summary of R&D work undertaken by Member countries, including that carried out within the context of other programmes. Finally, it makes proposals for future work within CRESP.

Disposal of Radioactive Wastes: Review of Safety Assessment Methods (A Report of the Performance Assessment Advisory Group of the Radioactive Waste Management Committee), in press.

The disposal of radioactive waste is a major issue in the nuclear debate. This report provides a concise and accessible overview of the methods available for evaluating the long-term safety of radioactive waste disposal systems, particularly those to be built in deep geological formations.

L'Évacuation des déchets radioactifs: Examen des méthodes d'analyse de sûreté (Rapport du Groupe consultatif sur l'évaluation des performances des systèmes d'évacuation des déchets radioactifs; Comité de la gestion des déchets radioactifs), en cours d'impression.

L'évacuation des déchets radioactifs représente l'un des éléments principaux du débat sur le nucléaire. Sous une forme concise et accessible, ce rapport fournit un panorama des méthodes disponibles pour évaluer la sûreté à long terme des systèmes d'évacuation des déchets radioactifs, et notamment des dépôts qu'il est prévu de construire dans des formations géologiques profondes.

Disposal of Radioactive Wastes: Heterogeneity of Groundwater Flow and Site Evaluation (Proceedings of an NEA Workshop, Paris, France, 22-24 October 1990), in press.

For underground disposal of radioactive wastes, particular attention must be paid to mobile groundwater, the primary medium by which these wastes could be transported from the repository to man's environment. Thus, in all national programmes for the geological disposal of radioactive wastes, high priority is given to hydrogeological investigation, and in particular to investigation of the spatial variations in groundwater flow systems. These proceedings present the results of a workshop organised to discuss the methods that can be used to obtain the understanding and data required for modelling of such flow systems, as well as the adequacy and appropriateness of the modelling techniques.

L'Évacuation des déchets radioactifs: Hétérogénéité de l'écoulement des eaux souterraines et évaluation des sites (Compte-rendu de la réunion de travail de l'AEN, Paris, France, 22-24 octobre 1990), en cours d'impression.

Pour l'évacuation définitive de déchets radioactifs dans le sous-sol, on doit porter une attention particulière à la circulation de l'eau souterraine, car celle-ci peut jouer un rôle déterminant dans le transport éventuel de ces déchets jusqu'à la biosphère. C'est pourquoi les responsables de tous les programmes nationaux relatifs à l'évacuation de déchets radioactifs en milieu géologique attachent une très grande importance aux études hydrogéologiques et notamment à l'étude des variations spatiales qui affectent les régimes de circulation de l'eau souterraine. Cet ouvrage rend compte des débats tenus lors d'une réunion de travail consacrée

à l'examen des méthodes susceptibles d'être utilisées pour parvenir à la compréhension de ces mécanismes, pour collecter les données permettant de modéliser ces régimes de circulation, ainsi que pour vérifier si les techniques de modélisation utilisées sont bien adaptées aux besoins.

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