

Radioactive waste management: International peer reviews

Countries are evaluating their programmes through the IAEA's Waste Management Assessment and Technical Review service

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International peer reviews have become a central feature of the IAEA's safety-related services. In areas of radioactive waste management, they are gaining greater attention among countries as an effective tool for objective technical feedback and assessment.

The Agency's peer review service for radioactive waste management — known as the Waste Management Assessment and Technical Review Programme (WATRP) — started in 1989, building upon earlier types of advisory programmes. WATRP's international experts today provide advice and guidance on proposed or ongoing radioactive waste management programmes; planning, operation, or decommissioning of waste facilities; or on legislative, organizational, and regulatory matters. Specific topics often cover waste conditioning, storage, and disposal concepts or facilities; or technical and other aspects of ongoing or planned research and development programmes. The missions can thus contribute to improving waste management systems and plans, and in raising levels of public confidence in them, as part of IAEA efforts to assist countries in the safe management of radioactive wastes.

This article presents a brief overview of recent WATRP missions and the review process itself. (*See box.*)

Recent peer reviews

Norway. In December 1994, the Norwegian Radiation Protection Authority requested a WATRP review of its work toward establishing a combined storage/disposal facility for low- and intermediate-level waste. The mission's main objective was to review safety-related aspects of

the approach to the selection of the site, the technical concept, and the long-term safety of the facility.

A team of five experts from Canada, France, Germany, Switzerland, and the United States was formed to conduct this review. The team received background documents in June and July 1995. After reviewing the documents, the team prepared a questionnaire for the Norwegian experts in advance of a review meeting with them during the last week of September 1995. The team's final report has been prepared and submitted to the Norwegian Radiation Protection Authority.

The team found that the legal system and the licensing process as they are applied to the projected facility correspond to international standards. The criteria which have been applied for the selection of the site for the planned facility are comprehensive and consider the important factors for both environmental protection and long-term safety.

The team recommended that it would now be important to select a final design for the facility and to develop the detailed plans. These plans should also address the later conversion of the storage part of the facility into a repository for the plutonium-bearing waste or the removal of this waste from the facility.

Slovak Republic. In December 1993, the Nuclear Regulatory Authority of the Slovak Republic requested a review of the Mochovce disposal facility for short-lived low- and intermediate-level radioactive waste. As requested, the review's scope was limited to parts of Slovakia's Pre-operational Safety Report that are related to the evaluation of the facility's safety. The team's work was based on written material provided, discussions with Slovak experts and their consultants, and the evaluation of some of the archived design and construction records.

Five experts from Canada, Finland, France, Germany and Spain conducted the review. The

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team's review meeting was held in May 1994 with Slovak experts at the Mochovce nuclear power plant. Slovak experts provided additional information on issues and questions raised by the team, and arranged for a technical visit to the Mochovce Radioactive Waste Disposal Facility.

The team considered the disposal facility's concept a good one. It recognized the various components of the total waste management system that are important to ensuring safety. The team noted, however, that the degree of emphasis and safety assessment work done on the various components of the repository varied considerably. Research now is being done to develop a comprehensive and fully integrated approach for safety. The desire of both the regulator and the disposal facility operator to benefit from the expertise of other countries has been an important element towards achieving safety goals.

The review team encouraged authorities responsible for the implementation of disposal at Mochovce to continue with their programme to further refine safety aspects of the disposal facility. Specific recommendations were detailed in the review report, taking into consideration the limited information reviewed. The review and recommendations covered the legal framework and waste disposal strategy; characterization and inventory of waste; design, site characteristics and construction; operation, closure and monitoring of the repository; performance assessment for the operational and post-operational phases; waste acceptance criteria; and specific quality assurance issues.

Czech Republic. The WATRP review in the Czech Republic was in response to a request in May 1993 from the State Office for Nuclear Safety and focused on the programme for the development of a deep geological repository. The main task was the assessment of the study of required research and development for the programme, which has been funded equally by the Czech and Slovak power companies. This study is limited to the deep underground geological disposal of high-level and long-lived low- and intermediate-level waste and described the planned technical programme for waste disposal.

In view of the early stages of the country's plans for deep geological disposal, the WATRP review was limited to considering the general approach to the development of the planned repository and did not include detailed critique of methodology and experimental procedures. The review team of five experts from France, Germany, Sweden, Switzerland, and the United States evaluated documents supplied by the Czech Republic and held discussions with Czech and Slovak scientists and engineers. The mission

Requests for IAEA Waste Management Advisory Reviews, 1978-95

Sweden: 1978, 1979, 1983, 1987. The reviews focused on programme reports of research and development activities associated with the handling and disposal of high-level reprocessing waste and spent fuel.

United Kingdom: 1988. The review focused on the NIREX research and development programme for a repository, specifically topics related to post-closure safety and site assessment.

Republic of Korea: 1991. The review focused on siting criteria for a disposal site for low- and intermediate-level radioactive waste.

Finland: 1992. The review focused on the overall nuclear waste management programme.

Czech Republic: 1993. The review focused on the programme for deep geological disposal.

Slovak Republic: 1993. The review focused on the near-surface disposal facility at Mochovce.

Norway: 1994. The review examined work being carried out on a combined storage and disposal facility for low- and intermediate-level waste.

also included a technical visit to the Litomerice-Richard II facility for radioactive waste from institutional sources.

The WATRP team made recommendations on the legal framework and organizational structure for radioactive waste disposal in the country, in particular the necessity for a definitive separation between the operational and regulatory functions. It also recommended that the responsibilities of the regulatory body, the waste generators, and the operator of the disposal facility be clearly defined; that a comprehensive set of regulations be prepared to include clear guidance on the responsibilities and limits of each party in the national high-level disposal programme; that the assignment of responsibilities for specific research and development tasks should be considered a priority; and that a clear method of funding for the programme be determined.

The team's technical recommendations included the need to obtain the maximum possible information from international experience, particularly on the design of waste packages, the design of geological repositories, underground test facilities, backfill and closure techniques, and the use and validation of computer codes for safety assessments. It recommended that dose/risk criteria appropriate to the chosen repository site be established in line with international practice, and that the establishment and implementation of a quality assurance programme be given priority as an essential part of the regulatory framework. The team's final report, submitted to Czech authorities in 1994, further highlighted the need for public interaction and involvement in the development and licensing of the waste repository.

Finland. The Finnish nuclear waste management programme was reviewed following a request in November 1992 from the Finnish Ministry of Trade and Industry. The mission principally addressed the work being done to site and build an encapsulation facility for spent nuclear fuel, and a repository to be located on the same site. The review also covered the plans and activities for conditioning and disposal of the low- and intermediate-level waste from Finland's nuclear power plants; and the plans for decommissioning Finland's reactors when that becomes necessary.

Four experts from Canada, Belgium, Germany, and Switzerland carried out the WATRP review. During the early summer of 1993, they reviewed a large amount of documentation supplied by the Finnish industry, government, and research organizations. In August 1993, the team met in Helsinki for detailed discussions with staff of several Finnish organizations involved in radioactive waste management. The meeting included a site visit to Olkiluoto, where two of Finland's four nuclear power plants are located and the repository for shortlived low- and intermediate-level waste (LILW) is in operation. Finland is among several countries studying sites for geological repositories, and its efforts, relating to the LILW repository were profiled in the *IAEA Yearbook* for 1992.*

During the WATRP review of Finland's programme for high-level waste disposal, the team was impressed with the high standard of work being done in Finland, and urged its continuance. It noted that although the Finnish nuclear power programme is younger than those of many other countries, Finland has re-

corded notable achievements in developing its technologies and capabilities for radioactive waste management.

WATRP experts further noted that Finnish scientists actively participate in many international working groups and committees, both contributing to the international understanding of a difficult subject and obtaining knowledge that they can apply to their own national programme.

In some cases, the team recommended modifications to the programme. For example, it suggested that the full-scale steel/copper canister for the disposal of spent fuel be manufactured and tested so that any difficulties in its manufacturing, loading, sealing, and subsequent emplacement in the repository can be identified as early as possible in the programme. The team also recommended that the Finnish regulatory body's resources should be at least maintained and possibly increased; that work should proceed to produce detailed regulations and guides on the criteria for obtaining approval to dispose of spent fuel; and that the proposed microbiological method of treatment of organic waste at the Loviisa nuclear power plant be tested at full scale as soon as possible with a complete range of organic compounds.

In reviewing the methodology of the planned repository's preliminary safety report, the team found it satisfactory. It noted that while some data was generic in nature, the final report would contain site-specific data. Overall, the team noted the prodigious amount of work performed within the site characterization programme and urged that the same effort and quality be continued.**

Benefitting from global peer reviews

As past experience has shown, issues of radioactive waste management attract considerable attention, particularly from the standpoint of safety of health and environmental safety. International peer reviews can be valuable components of national efforts to obtain objective assessments of their programmes and plans.

At the IAEA, the WATRP programme is one of a number of advisory and technical services through which countries can benefit from the exchange of international experience in this important field. For years ahead, the IAEA is working to promote international co-operation for the safe and sound management of radioactive waste through its full range of programmes and services. □

*The *IAEA Yearbook* is published annually by the Agency and is available for purchase from the Division of Publications or sources in IAEA Member States. See the "Keep Abreast" section of the *IAEA Bulletin* for ordering information.

**The Finnish Ministry of Trade and Industry has published the WATRP report, "Evaluation of the Finnish Nuclear Waste Management Programme, Report of the WATRP Review Team", *Reviews* B:181, Painatuskeskus Oy, Helsinki (1994).

Overview of WATRP Review Process

WATRP's main objective is to provide IAEA Member States with an independent international peer review of their radioactive waste management programmes. Reviews are made by teams of international experts in the field.

Three principal elements are involved in the review process: a) evaluation of technical documentation and other programme-related material, b) technical discussions and exchange of information with experts of the requesting Member State or organization, and c) preparation of a report with the team's conclusions and recommendations. Reviews generally are tailored to the needs of a particular country at its request, and they may include technical visits to sites. Requests from a Member State for a WATRP review of its radioactive waste management programme must be made in writing to the IAEA.

Once the review's scope and terms of reference are determined by the requesting organization, the IAEA initiates the selection and recruitment of international experts for the review team. Selected experts serve in their individual capacities and their opinions are not necessarily those of their respective governments or the Agency. For each WATRP review a different team is formed. The size and expertise of the team depends on the scope of the review and subject areas to be covered. Normally, the WATRP team is composed of five experts, though particular requests for investigations of specific areas in greater depth or of many issues may require a larger team. The Agency selects a WATRP team leader from among the experts who is responsible for the co-ordination and liaison with other team members, as well as for conducting the WATRP review meeting and drafting the final report. Also on the team is an IAEA staff member from the Agency's Waste Management Section, who provides overall assistance and guidance.

Before the mission takes place in the requesting country, team experts review technical documentation and materials about the country's waste management programme. From their evaluation of this information, the team prepares a questionnaire that details areas requiring clarification. Once finalized, the questionnaire is sent to the national counterpart in the requesting country before the actual review meeting takes place.

Using the questionnaire and the country's response to it as a basis, the WATRP review meeting, typically one week long, focuses on any open questions, and on discussions of the team's findings and recommendations. Normally attending the review meetings along with the WATRP team members are national representatives from the requesting country or organizations and representatives of firms or organizations responsible for particular technical documentation submitted for review and related research and development activities. Following the meeting, the WATRP team completes its final report, which is submitted through the IAEA to the national organization requesting the review. The report is the property of the requesting organization, for use at its own discretion.

A WATRP team visits the proposed site for storage and disposal of low- and intermediate-level waste at Himdalen, Norway. From left, M. Bell, USA; J.-I. Kim, Germany; D. Delattre, France; A. Bonne, IAEA; D. Metcalfe, Canada; E. Warnecke, IAEA; and A. Zurkinden, Switzerland.

