

DEEP REPOSITORY DEVELOPMENT IN THE SLOVAK REPUBLIC – LEGISLATION BACKGROUND AND PRESENT STATUS

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ABSTRACT

The Slovak Republic national policy of the management of spent fuel and radioactive wastes non-acceptable to the near surface repository results from the Governmental decision No.930/92. This document requires that those materials (after appropriate treatment) will be disposed in a deep geological repository. Efforts on development of deep geological disposal of high level wastes and spent fuel in the Slovak Republic after division of Czechoslovakia have been ongoing since 1996. As the first step in development activities it was necessary to revise the federal methodology document "Project of deep disposal development" published by Nuclear Research Center Rez in 1993, pertaining to specific conditions of the Slovak Republic. Decom Slovakia Ltd., under contract to Slovak Electric (state owned plc) performed the revision.

Since construction of a deep geological repository affects different areas of society, the applicable legislative documents have not been yet prepared. Definition of legislative requirements connected with a deep geological repository is an important part of project development. A number of the legislative documents have been introduced during the last years. These documents must cover a whole system of radioactive waste management including the activities aimed to realisation of a deep repository. The legislation background and present status of the deep geological repository development is described in this paper.

INTRODUCTION

The systematic development of a deep geological repository was initiated in the Slovak Republic in 1996. The Decom Slovakia performed the revision of the federal methodology document "Project of deep disposal development" elaborated by Nuclear Research Center Rez in 1993 (1) under contract to Slovak Electric. The new methodology document (2) has become the basic document for definition of the individual tasks of deep geological repository development.

The work was based on a screening of the Slovak territory provided by the Geological Service of Slovak Republic and on generic and conceptual reports roughly defining the problems. Although most of the cost was covered by the State Fund of Nuclear Energy Facility Liquidation and Spent Nuclear Fuel and Radioactive Waste Management, important funding was also received from the Ministry of Environment (geological survey) and Slovak Electric (co-ordination). The team performing the studies consisted of several contractors co-ordinated by Decom Slovakia. The project is supervised by a steering committee, created and composed of representatives of the Ministry of Economy, the Ministry of Environment, the Ministry of Health and the Nuclear Regulatory Authority.

LEGISLATION BACKGROUND

The creation of new legislation of the Slovak Republic began after division of the former Czechoslovakia. The following legislation documents pertaining to radioactive waste management (and therefore also to the deep geological development) were issued and implemented after 1993:

- Act No. 127/1994 ON THE ENVIRONMENTAL IMPACT ASSESSMENT
- Act No. 272/1994 ON PROTECTION OF PUBLIC HEALTH amended and changed by Act No. 290/1996
- Act No. 254/1994 ON THE STATE FUND OF LIQUIDATION OF NUCLEAR ENERGY FACILITIES AND SPENT NUCLEAR FUEL AND RADIOACTIVE WASTE MANAGEMENT
- Act No.130/1998 ON PEACEFUL UTILIZATION OF NUCLEAR ENERGY (ATOMIC LAW)
- Regulation of Ministry of Environment No.19/1996 ON CHARACTERIZATION OF WASTE + CATALOGUE OF WASTE

Some problems and difficulties during practical application of the new legislation exist. These arise from the high content of prescriptive provisions (including a lot of details, figures and tables in legislation documents). The following description of some elements of the individual acts clearly shows the problems of their application in the field.

Act No. 127/1994 ON THE ENVIRONMENTAL IMPACT ASSESSMENT

The following elements are applicable to radioactive waste management:

- some requirements and procedure for planning and intervention actions,
- each nuclear activity will be assessed due E.I.A. procedure.

The appropriate level of details for the individual assessment has not been in the Act determined. The consequence of this fact is that only formal evaluation exists for different causes.

Act No. 272/1994 ON PROTECTION OF PUBLIC HEALTH amended and changed by Act No. 290/1996. The definition of terms “for purposes of these acts are following:

- “radioactive waste” - waste arising by management of ionizing radiation sources and containing radioactive sources (*radionuclides with concentration higher than exemption levels - table amended*) and objects which from the reason of content of radioactive sources or non-removable contamination cannot be freely introduced into the environment with exception of radioactive waste from operation of nuclear facilities and spent fuel,
- “removing (disposal) of radioactive waste” - collecting, separation, treatment (conditioning) and storage on the workplace and transmitting to physical or juridical person authorized for the ionizing sources management according the act,
- “introducing (release, disposal) of the solid radioactive waste into environment” - its disposal in repository or utilization for another purposes after processing,
- “introducing (release, disposal) of gaseous and liquid radioactive waste into environment” - its discharge into environment.

The definitions of these terms are not fully consistent with IAEA Glossary [3], which caused different problems during its practical application.

Act No.130/1998 ON PEACEFUL UTILIZATION OF NUCLEAR ENERGY (ATOMIC LAW). The act covers siting, design, construction, commissioning, operation and decommissioning of nuclear facilities including nuclear material management, spent fuel and radioactive waste management. The 16 lower level legislation documents stipulated to issue on the different parts of the act. The radioactive waste management is covered by §17 with the following elements:

- definition of radioactive waste is consistent with the IAEA Glossary [3],
- definition of radioactive waste management - each steps for waste streams arising in nuclear facilities; conditioning to disposal, transport and disposal of institutional wastes,
- “polluter pays” principle,
- permission for clearance of radioactive materials (not covered by the Act on protection of public health) from nuclear facilities,
- establishment of organization responsible for radioactive waste disposal by Ministry of Economy (repositories must be situated on the state-owned ground).

PRESENT STAGE

The design of deep geological repository is performed in the several sub-programmes. The each sub-programme has defined concrete tasks, namely:

- design and implementation activity:
 - technical design proposal of the deep geological repository for hypothetical site and two alternative host geological formation – proposal of conception solution of disposal facility, where attention is paid to technical solution of surface and auxiliary facilities, underground facilities, transport, manipulation, control and conditioning of spent fuel and high level waste and its package into the disposal containers,
 - evaluation of the deep geological repository preparation and implementation phases – the definition of the deep geological repository background and implementation requirements from the point of view of safety, technical and economical issues,
 - appraisal of the deep geological repository alternatives for hypothetical site – specification of legislative acts and documents indispensable in the course of repository design and licence process,
 - study of underground research laboratory – world-wide experiences, analysis and solution for the Slovak Republic,
 - feasibility study of deep geological repository – study will be performed on the basis of updated knowledge in 2000,
 - critical path and system study of deep geological repository – system analysis with respect to development of technologies and equipment for repository (finished in 2000).
- source term:
 - expected inventory of deep repository – description of the physical and chemical properties of spent fuel and high level waste to be disposed,

- evaluation of spent fuel characteristics – radionuclide composition of spent fuel as a function of time, neutron fluxes, expected dose, contribution of cladding and other parts of fuel assemblies to the total radionuclide inventory and production,
- source term modelling – mechanism study of radionuclides releasing from spent fuel and high level waste in repository environment.
- near field:
 - review of modelling and software for near field assessment – critical review of current world status of near field modelling,
 - acquisition of input data for near field – review of available information on engineered and construction materials of deep geological repository and materials of disposal container,
 - study of disposal container design for the VVER 440 spent fuel – review of different alternatives of disposal container design and proposal for the Slovak Republic,
 - study of disposal container sealing – description of physical and chemical properties of buffering and sealing materials,
 - analysis of transport and retard migration processes in engineered barriers – description of processes important for radionuclide transport retardation in engineered barriers of near field and factors influencing these processes.
- far field:
 - review of engineered and geological barriers modelling for far field – critical review of current world status of engineered and geological barriers modelling, corresponding software and results of international co-operation and projects,
 - far field modelling – review of world status of ground water modelling as a dominant radionuclide transport factor,
 - 3D modelling of the geological barrier – development of 3D model of geological barrier for selected sites suitable for deep geological repository,
 - hydrogeochemistry of interactions between host rock environment and engineered barriers – analysis of possible interaction of host rock environment and materials of engineered barriers due to expected hydrogeochemical processes.
- siting:
 - supplement of site selection criteria – proposal of site selection criteria with possibility of their gradual supplementation and processing in future,
 - evaluation of selected prospecting sites – recent investigation resulted in identification of fifteen perspective localities as potentially suitable sites for deep geological repository,
 - geophysical exploration of prospective sites – verification of basic geological structural elements in near surface zone of earth crust by the means of simple geophysical methods,
 - neotectonic and geomorphologic development of prospective sites – description of updated status of neotectonic and geomorphologic processes of perspective sites and prediction of their evolution for nearest 100 000 years,

- proposal of study sites – proposal of study sites for more detailed investigation.
- safety analyses:
 - critical review of models for safety analysis – review of model approaches for individual issues of safety analysis used in abroad and evaluation of their applicability in Slovak program,
 - scenario development – internationally accepted methodology of scenario development, supporting tools and compilation of FEP database,
 - development of the conceptual and mathematical models – selection of appropriate conceptual and mathematical models for safety evaluation of individual subsystems of repository,
 - uncertainties and building of the safety analyses confidence – evaluation of uncertainties, confidence building for applied models and data and description of methods for uncertainty decreasing.
- involvement of the public:
 - compilation of an international approach to public awareness in the design of deep geological repository – review of different approaches to, and experiences of, the issues of public awareness, public opinion and public involvement in relation to the peaceful use of nuclear energy,
 - identification of the main problems in connection with public awareness – compilation the overview of works dealing with socio-economic impacts of different investment activities and selection and formulation of the socio-economic impact of repository construction and operation,
 - attitude of the public opinion towards the radioactive waste management – acquisition of information on negative attitude and arguments against nuclear energy and identification of possible ways how to eliminate they,
 - definition of the socio-economic impacts of deep geological repository development and analysis of potentials impact to public – analysis of socio-economic impacts to public due to development and presence of deep geological repository.
- interrelations to legislation:
 - compilation and review of the foreign legal documents relevant to deep geological disposal issues – identification and summarization of important legal documents existing and/or logical expectable which should be taken into account during the program of deep geological repository development,
 - first review of relevant national legislative documents relevant to deep geological repository development – revision and review of existing national relevant legal and regulatory acts,
 - deep repository in the relation to radioactive waste and spent fuel management.

- quality assurance:
 - guide-lines for quality assurance plans elaboration – guide-lines for quality assurance plans elaboration for activity related to deep geological repository development,
 - methodical assistance for fulfilment of quality assurance requirements at contractors – activity to achieve of the quality assurance required level at individual contractors.
- co-ordination:
 - methodological handbook of management of deep geological repository development – definition of approach to the project management of deep geological repository development,
 - proposal of information system for deep disposal programme – proposal of archive system for storage and maintenance of documents and data for deep geological repository development and proposal of information system for this program,
 - annual report of deep repository development programme – annual reports summarize achieved results in given year and updated status of deep repository development program,
 - detail plan for deep disposal development for the years 1998-2000 and 2001-2005 – detailed and frame plans of deep geological development for given periods,
 - preliminary E.I.A. study – documentation for the next assessment according to requirements of Act.No.127/94 on the environmental impact assessment.

CONCLUSION

The definition of individual tasks until year 2000 was the inseparable part of the methodological document (2) elaborated by Decom Slovakia. The each particular task of deep disposal development contains ideas about well-defined activities, financial costs and solution outputs as well. The first results of individual sub-programmes show a good basis for the deep repository development in the Slovak Republic.

REFERENCES

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