

WATRP Mission to the Czech Republic

International peer review
of the Czech programme of the geological repository development

Background materials

b5) Scientific Support of RAWRA

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1 Scientific support of RAWRA

According to the Atomic Law, RAWRA is, among others, responsible for a co-ordination of the research and development in regard with disposing radioactive waste and spent nuclear fuel. This support is provided in two main directions: as R&D aiming at gaining data for the development of a geological repository and as a generic research solving the management of HLW and SNF in a broader sense. While the former deals mostly with applied science and targeted research, the latter is a typical example of the basic research and includes exclusively partitioning and transmutation studies.

The research services are provided by both commercial and academic institutions, some of them being linked to international projects. RAWRA promotes any involvement of Czech research institutions in international programmes as this is rather effective and direct method of transferring knowledge and experience for the needs of the Czech waste management programme. Furthermore, some projects are so large, and thus complete and expensive, that they can not be solved within a national frame. Finally, this international linkage allows for a mobilisation of specialised capacities which are not available in the required level or extent from domestic sources (e.g. advanced investigation techniques).

Some typical examples of research activities performed within the Czech geological repository programme are bellow. It should be mentioned that RAWRA supports financially the participation of Czech institutions in both EC and NEA/OECD projects and also other activities are covered by the financial sources released from the Nuclear Account through RAWRA budget.

1.1 Science for geological repository development

Czech GR development programme completed conceptual and planning stage and, thus, technical activities have been initiated recently, such as site screening and characterisation. These initial geological works are classified in the Czech legislation as the Research of the Homogeneity of the Bohemian Massif and will be performed by a number of mostly commercial institutions. Currently, a consortium GEOBARIERA (managed by SG Geotechnics and with a foreign partner) has been performing airborne geophysical investigation of selected regions.

More typical example of research in this phase of the siting is so called "Testing site project". A reason for its creation is a need of providing a training polygon for mastering some geological techniques and methodologies and their interpretation. However, the way in which these testing polygons are being selected can be considered practically as the development and testing of a methodology to be applied at study sites. This project is managed by the Czech Geological Survey supported by some other institutions (geophysical, drilling companies). A drill completed on the site was used to collect underground water samples for project PADAMOT (carried out within 5th EC framework programme) in which Czech Republic is represented by the Faculty of Natural Science of the Charles University (FGS-CHU).

More than 20 years ago a 5 km long tunnel was drilled and blasted in a granitic rock for a drinking water pipeline. The consequences of the used mining technologies and a development of the rock (and namely of the excavated disturbance zone) with elapsing time are being studied in real conditions. The project manager is Czech Geological Survey, but the involvement of private consultants who took part in tunnel excavation is a key feature of this research.

Much is known in the world about potential materials for construction of engineered barriers. Even if only verification of their use in geochemical conditions of the considered host rock is

needed within the Czech programme, extensive research is being initiated to collect real data for safety and performance assessment studies. It is aiming at the selection of sealing/buffering materials (montmorillonitic clays) and suitable materials for package and overpack of SNF and their degradation, and also for packaging of ILW to be disposed of in the geological repository. Geotechnical research is carried out at the Centre of Experimental Geotechnics of the Faculty of Construction Engineering of the Czech Technical University, while mineralogy is studied at FGS-CHU, sorption capacity at the Institute of Chemical Technology, and corrosion and diffusion characteristics at the Nuclear Research Institute Rez. In some of these projects also foreign partners are involved, e.g. SKB (Sweden) and POSIVA (Finland), some activities have been performed within 5th and 6th FP EC (FEBEX, NF-PRO) and within Co-ordinated Research Programmes of the IAEA (Swelling clays, Extrapolation of short time experiments ...).

NEA/OECD co-ordinates several projects regarding geological disposal. In two of them Czech institutions have also participated. These are Thermodynamic Database (with the Chair of Analytical Chemistry of the Masaryk University Brno) and Sorption Project where the Chair of Radiochemistry of the Faculty of Nuclear Engineering represents the Czech scientific community.

Within the Czech GR programme also analogue studies are performed, both natural and anthropogenic ones. As the natural analogue a site with U mineralisation among clayey layers is investigated by NRI Rez in co-operation with FGS-CHU and GRS Braunschweig. Anthropogenic analogies (dissolution/migration rates and sorption characteristics) are studied by FGS-CHU at dumping sites where U coloured glass and U contaminated slag from production of non-ferrous metals were kept for several centuries. Also, sorption/diffusion of radionuclides in concrete samples that were long time in contact with high Ra water is tested by NRI Rez. The latter projects are presented also within IAEA Co-ordinate Research Programme on Anthropogenic Analogues.

Data and methodologies supporting safety and performance analyses are the main goals of the 5th FP EC projects SPIN and BIOCLIM. A Czech representative in both projects is NRI Rez.

1.2 Partitioning and Transmutation

The national strategy on waste and SNF management approved in May 2002 by the Czech Government requires that alternative technologies of SNF management are supported from the Nuclear Account. These technologies include partitioning, both hydrometallurgic and pyrometallurgic, and transmutation in advanced types of reactors (ADTTA or MSR). These projects are run within 5th and 6th FP EC; they are supported also directly by the Czech Government. Even if scientific capacities are concentrated only to several institutions, their overall capacity and specialisation allows for their participation in number of national and international research projects. For example, CALIXPART (solvent extraction), PYROREP (fluorination), EUROPART (both) have been performed in NRI REZ; MOST (MSR technology overview) in NRI, Skoda Plzen and ENERGOVYZKUM Brno; BLANKA (calculation of blanket for a transmutor) in NRI and Faculty of Nuclear Reactors of the Faculty of Nuclear Engineering of CTU; the inventory of SNF from Czech NPP's was calculated and a code for calculation of thermal output of fuel assemblies was developed at FNR-FNE-CTU, etc.