



# THE REGULATORY ROLE OF THE HUNGARIAN GEOLOGICAL SURVEY IN THE CLOSURE OF MECSEK URANIUM MINE

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## Abstract

Under Mining Act XLIII established in 1993, the Hungarian Geological Survey was given a wide range of authority related to the environment, mining, nuclear and general constructions. In implementing these task the Survey will be supported by the well established Geological Institute of Hungary and the Eötvös Loránd Geophysical Institute. The Survey's role in the nuclear field includes the licensing of plans and reports on geologically related research to any nuclear facilities. The Hungarian Geological Survey is also co-authority on matters related to the establishment, construction, modification and closure, environmental protection of nuclear facilities in general and all matter related to uranium mining. The Survey's regulatory activity in radioactive waste management follows the Decree of the Minister of Industry and Tourism 62/1997 which is based on the Atomic Energy Act CXVI of 1966. These regulations were prepared in harmony with the OECD Nuclear Energy Agency and the International Atomic Energy Agency conventions, standards and guides and those of other countries. Case histories on the applications of these regulations to the closure of Mecsek uranium mine and the operation of the research laboratory tunnel for long-lived, high level radioactive waste are presented here.

## 1. INTRODUCTION

The Hungarian Geological Survey (hereinafter referred to as "Survey") established in 1993 by the XLVIII. Mining Act has wide and sound regulatory rights and related tasks in many fields as environmental, mining, nuclear and construction affairs. The regulatory measures are accompanied by public service (mostly geological data service) and backed up by research activities of its financially independent institutes, the 130 years old Geological Institute of Hungary and the 80 years old Eötvös Loránd Geophysical Institute. The Survey performs all the above-mentioned three functions in the nuclear field, details of the regulatory side are presented hereby.

## 2. REGULATORY RIGHTS AND PRACTICE

The Survey's expert authority rights are established in the 132/1993 (IX.29) Government Decree. This Decree defines the competency of the Geological Expert Authority in licensing procedures by citing the relevant legal acts and gives the general outline that the seven Regional Offices should act in the first degree proceedings. In case of declined applications the client can appellate and initiate a second proceeding at the Geological Expert Authority. The total number of cases that were proceeded at the Survey was 1939 in year 1997. Most procedures were related to mineral exploration, mining and environmental affairs, less expertise was issued in land use planning, nature protection, construction licensing, etc. The spatial distribution of cases reflect the different development of the counties, where there are more cases in the western part of Hungary.

The Survey's regulatory mission is three-fold:

- (a) to protect the geo-environment against the unfavourable human impacts (e.g. contamination by hazardous wastes);
- (b) to protect the human environment against geo-hazards (e.g. landslides, earthquakes, liquefaction of soils);
- (c) to protect mineral resources and to promote their sustainable exploitation.

The object of the Survey's regulatory work is the geo-environment (lithosphere) which can be defined as the complex totality of the solid, liquid and gaseous phases of the Earth's subsurface. The subject of this expert activity is the interaction between geo-environment and human activity in general which demands a dynamic way of interpreting and evaluating these complex, time-dependant processes.

The regulatory attitude of the Hungarian Geological Survey is a performance-based approach. This approach and practice involves that no or just a few prescriptive, quantitative standards and requirements are forced and the licensee is required to comply with the given objectives and measures with a certain freedom to achieve. The Hungarian law gives a chance for the communication between the client and the authority that is a frequent practice at the Survey.

### 3. ROLE IN THE NUCLEAR FIELD

The Survey's regulatory role in the nuclear field is multiple. It is the licensing authority of plans and final reports of geological research related to nuclear facilities in general (power plants, research reactors, waste disposals) and the recording authority of all the nation's mineral resources and reserves including uranium ore reserves as well.

The Survey is a licensing co-authority in

- (a) establishment, construction, modification and closure of nuclear facilities in general;
- (b) environmental protection licensing of nuclear facilities (reviewing environmental impact studies, performance assessments and audits);
- (c) uranium mining affairs (reviewing research plans and reports, annual technical plans, remediation plans, opening and closure plans of mines).

The co-authority role means that the Survey's expertise has to appear in the final decision of the licensing authority (e.g. in that of the Environmental Inspectorate).

The basic legal act encompassing and governing the Survey's regulatory activity in radioactive waste management is the Decree of the Minister of Industry, Trade and Tourism 62/1997 (XI.26) on the Geological and Mining Requirements for the Siting and Planning of Nuclear Facilities and Radioactive Waste Disposal Facilities in accordance with the Act CXVI of 1996 on Atomic Energy.

This Decree gives the most important definitions (e.g. geological barrier, potential site, institutional control, etc.), the methodology and geological requirements of site selection and characterisation, the essential elements of quality assurance and control, the general geological and mining requirements, details of the licensing procedure, and in four appendices the special geological requirements for siting of (1) nuclear facilities; (2) deep geological disposal facility for high-level radioactive waste; (3) deep geological disposal facility for low- and intermediate-level radioactive waste; (4) surface and near-surface disposal facility for low- and intermediate-level radioactive waste. A special procedure appears in the Decree that the applicant may request a preliminary expert opinion of the Survey prior to commencement of the licensing procedure.

These regulations were set in harmony with the OECD Nuclear Energy Agency and the International Atomic Energy Agency conventions, standards and guides, and the relevant regulations of some countries (e.g. France, Finland, USA, Germany, Japan, etc.) were considered as well.

## 4. REGULATORY ROLE IN THE CLOSURE OF MECSEK URANIUM MINE

### 4.1. Mecsek uranium mine

The Mecsek Uranium Mine was in operation between 1956 and 1996. It had six mining plots (65 km<sup>2</sup>) which covers 18 Mm<sup>3</sup> underground space, 1.5 Mm<sup>3</sup> is still open. Its facilities were thirteen shafts, one enrichment plant, two leaching heap piles (47 ha, 400 t U), two tailing ponds (20.3 Mt slurry, 1330 t U) and ten waste rock piles (9.8 Mm<sup>3</sup>, 1030 t U).

### 4.2. Environmental licensing

As a licensing co-authority the Survey's South Transdanubian Regional Office (hereinafter referred to as "Office") reviewed the preliminary and detailed environmental assessment studies of the mine closure. It required quantitative data of uranium, other radioactive elements and their daughter isotopes in form of documented, balanced equations considering exploitation, milling and enrichment activities, export and disposal. The Office asked for the geochemical characterisation of the tailings and slurries (e.g. sulphate, heavy metals, radiochemicals), and for an assessment of how these elements and compounds are fixed or can migrate to the surface or to groundwater reserves.

Another conflict field was the protection of the potable groundwater reserves of Pécs. The Neogene aquifer system is in direct communication with the partially contaminated groundwater of the Late Palaeozoic - Mesozoic rock formations. The preliminary impact assessment did not study this problem in depth. A detailed study and a hydrogeological monitoring system was prescribed.

According to the recharged groundwater level rise and the high volume of loose underground spaces the Office requested for a geomechanical study to assess future surface movements that can jeopardise buildings and other facilities. Additional geomechanical monitoring system was prescribed. The Office criticized the planned design of the soil cover for the leaching heap piles which was not appropriate from radiation protection nor from erosion protection point of view.

### 4.3. Technical plans

The annual technical plans of exploitation and technical plans of closure and remediation were reviewed by the Office. The Office required to submit the complete mining geological documentation including the maps of the latest operation phase and the maps of the exploration facilities (e.g. boreholes, geophysical profiles, etc.). The Office missed the detailed accounts of mineral resources exploited. Moreover it required to prepare and submit a final summary report of the geological exploration works carried by the Company.

### 4.4. The future of "α" test tunnel

The Boda Siltstone Formation, a potential host rock formation for high-level radioactive waste, has been studied in a tunnel of Mecsek Uranium Mine as an underground laboratory since 1993. This low porosity and permeability, pelitic formation underlies the uranium-rich Upper Permian — Lower Triassic red sandstone formation which was exploited in the mine. This test tunnel was constructed and furnished with the most up to date equipment to study in situ the hydrogeological, geochemical, mineralogical-petrological and geomechanical

properties of the formation as a potentially suitable one to accommodate long-lived, high-level radioactive waste.

The annual research reports are generally accepted by the Survey without any serious objections due to the high quality of scientific performance. The future of the underground laboratory is a function of the details of closure of the mine because the survival of the two shafts needed for the operation is a financial problem.

## 5. CONCLUSION

Being the basic and most complex earth science, geology is a base to assess and judge subsurface material processes - including radioisotopic processes (e.g. sorption, migration, etc.) - that can effect human environment. Understanding this the Hungarian Parliament and Government gave sound regulatory rights to the Hungarian Geological Survey in many licensing procedures. According to the professional attitude, the Survey's expert opinions were decisive in many cases. The multiple regulatory functions of the Survey prevail in the nuclear field and especially in the closure of Mecsek Uranium Mine as well. This may help to minimize the risk of unfavourable impacts on present and future populations living there.