

CHANGING OF HUNGARIAN INFRASTRUCTURE IN RADIOACTIVE WASTE MANAGEMENT - A STEP FORWARD -

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ABSTRACT

In 1996 the Parliament of the Hungarian Republic enacted a new Act on Atomic Energy which provided new framework for activities related to the radioactive waste management and decommissioning of nuclear facilities. The newly established Agency for Radioactive Waste Management has been designated to carry out the multilevel tasks.

In concurrent with these changes in infrastructure, Hungary is about to make significant strategic and technical decisions. On completion of the previous investigations, decision is imminent concerning the suitability of the selected site for a geologic repository for L/ILW. A revised back-end policy taking into account the new circumstances has to be developed as well.

The final report evaluating the results of the HLW site investigation program carried out up to now in the exploratory tunnel and boreholes drilled from the uranium mine is expected to be ready by early 1999. The decision on the continuation of the program – with the possibility to establish an underground laboratory – is about to be made soon.

Before 1998, reserve fund for the future costs of nuclear waste management and decommissioning of nuclear facilities was not set up in Hungary. The new Act provided for the Government to take steps aimed at setting up a financial system to implement a coherent and comprehensive solution for the back-end of the nuclear fuel cycle and disposal of radioactive waste. In the future financing these tasks will be provided from the Central Nuclear Financial Fund.

INTRODUCTION

At the turn of the millennium, the Hungarian economy can hardly be imagined without nuclear technology which has been applied in a fairly wide scale in the agriculture, industry, medicine and it is determinant in the production of electric energy. The domestic use of the nuclear technology offers significant economical advantages mostly in the electric energy industry, where more than 40 % proportion of the nuclear power in the total production keeps the consumer's price at an acceptable level.

The rising use of the nuclear technology, however forces the society to tackle several problems. Of these challenges it is the disposal of radioactive wastes and decommissioning of the nuclear facilities that very often stirs emotions and provokes heated debates. The concerns should be dealt with and feasible solutions have to be found.

In recognition of this, in 1996 the Parliament of the Hungarian Republic enacted the law on atomic energy which provides that the performance of tasks related to the radioactive waste

management and decommissioning of nuclear facilities will be accomplished by an organisation designated by the Government.

There are four technical priorities for the coming years such as improving the existing repository, construction of a new repository for short-lived waste (L/ILW), extension the interim storage capacity for spent fuel and selecting a site for a high-level waste repository.

At the same time it is of utmost importance to form and maintain good relation with the public during the realisation of these projects. The experience has shown that in the past the nuclear energy's weak point has often been a lack of transparency together with inadequate communication and dialogue with the public. In the future the key element in the implementation of radioactive waste management programmes should be the openness and co-operation with the public.

LEGISLATION AND ORGANISATIONAL STRUCTURE

The new Act on atomic energy regulates – among others – the performance and financing of tasks related to the radioactive waste management and decommissioning of nuclear facilities. In this respect its basic principles are in conformity with the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

The Art. 40 of the new Act stipulates clearly as regards the radioactive waste management and the decommissioning of the nuclear facilities: “Final disposal of the radioactive waste and interim storage of the spent fuel, together with the activities related to the tasks of decommissioning the nuclear facilities shall be dealt with by an organisation appointed by the Government, as their solution is a national interest.” According to the Article 62 of the Act, financing the tasks mentioned above shall be provided from the Central Nuclear Financial Fund.

The Government, in its Decision N° 2414/1997 authorised the Director General of the Hungarian Atomic Energy Authority (HAEA) to establish a company entitled as “Public Agency for Radioactive Waste Management” (abbreviated as PURAM). The deadline was July 1, 1998. According to this Decision, PURAM takes over the tasks related to collection, treatment, transport, storage and disposal of radwaste of small scale producers from the National Public Health and Medical Officer Service and at the same time the operation of the repository at Püspökszilág is also handed over to PURAM.

COST AND FINANCING

Before 1998, reserve fund for the future costs of nuclear waste management and decommissioning of nuclear facilities was not set up in Hungary.

The new Act provided for the Government to take steps aimed at setting up a financial system to implement a coherent and comprehensive solution for the back-end of the nuclear fuel cycle and disposal of radioactive waste.

All costs for managing and disposing of radioactive waste and spent nuclear fuel must be paid by the waste producers. The member of the Government, who supervises the HAEA, is responsible for the operation of the Fund – as the dispose of the Fund – and through the HAEA – as the manager of the Fund – provides of carrying out the management tasks associated with the operation of the Fund.

The licensee (or, in the case of budget funded organisations, the budget) is liable to cover the costs of the final disposal of radioactive waste, as well as the interim storage and final disposal of spent fuel. For this purpose the Central Nuclear Financial Fund was established. The Fund is a separate State fund exclusively earmarked for financing the construction and operation of facilities for the final disposal of radioactive waste, as well as for the interim storage and final disposal of spent fuel, and the decommissioning of nuclear facilities. Payments into the Fund by licensees of nuclear facilities will be determined in such a way that the Fund will fully cover all the costs arising from the waste management, both from the operation of the facility and its decommissioning. In case of the nuclear power plant, payments made by the licensees to the Fund should be taken into account as expenditure when pricing electricity. In order to ensure the stability of the value of the Fund a certain amount of money is provided from the Government's budget calculated on the base of real rate of return.

The payments into the Fund started on January 1, 1998.

IMPROVING THE EXISTING DISPOSAL SITE

The only radioactive waste repository in Hungary at Püspökszilág has been in use since 1976. It has received waste from various laboratories, medical institutions, and, in particular, has been the site for the disposal of a number of spent sources. The repository also received low level solid waste from Paks Nuclear Power Plant.

The repository is a typical near-surface engineered facility consisting of concrete vaults and wells for the disposal of spent sources. Some waste in the vaults has been backfilled with cementitious material; other wastes are not yet backfilled. The vaults and wells are located above the water table in relatively impermeable rock. It is envisaged that a number of operations would be carried out before closure of the facility including the emplacement of a clay layer over the vaults and the backfilling of wastes within the vaults.

The future development of the Püspökszilág facility is unclear. A firm basis is required to support decisions concerning the future development. The safety of the Püspökszilág facility has not yet been the subject of any comprehensive assessment. In the past, the Hungarian Geological Survey has opposed issuing a permanent license, on the grounds of geological suitability. Currently a program of work is recommended, which includes the completion of a comprehensive safety assessment. This would provide a view on the safety of the facility based on work undertaken by local and Western experts. This assessment would conform to international best practice as set out by the International Atomic Energy Agency (IAEA) and Nuclear Energy Agency (NEA).

In addition to a comprehensive safety assessment of the facility, consideration will be given to possible developments at the site. Developments could include:

- the removal of certain waste types from the site;
- remedial measures to improve safety related to wastes that are currently disposed;
- the disposal of further wastes and expansion of the existing facility.

Based on the performance assessment calculations undertaken for closure of the existing repository, the implications of such developments to post-closure safety will be examined.

SITE SELECTION FOR A NEW L/ILW REPOSITORY

Since the capacity of the existing repository is running short, from 1993 onwards, in the framework of a National Project the Geological Institute of Hungary and many other institutions have performed the site exploration for a new L/ILW repository. Near surface and underground (at a depth of maximum 300 m) disposal was evaluated. The investigations were performed in four stages. Firstly the whole of Hungary, secondly a selected area (Mezőföld) were covered by desk-top studies. Public approval was given to just a few dozen out of several hundred potential geological objects. Four prospective areas, three for near surface and one for underground disposal, were covered by field reconnaissance. Boreholes were drilled at two near surface (loess) and one underground (granitic) sites. The granite at Üveghuta site seemed to be more suitable when compared with loess. The investigations summarised above closed the first phase of the National Project, and their results form the basis for designing studies in the second phase. The second phase of the National Project consists of three stages:

- selection of a site in granite massif,
- assessment of the geological suitability of the selected site,
- characterisation of the selected site.

The first stage of the second phase consisted of a geological evaluation of five areas in the neighbourhood of the original Üveghuta borehole. This evaluation was completed by July 1997 and a site at the major groundwater watershed was selected for study in stage 2.

The second stage comprised drilling of four deep boreholes. The boreholes were fully cored and logged. Borehole televiwer was added to the standard suite of geophysical tools used in the 1996 work and this permitted the three-dimensional definition of fracture orientations.

The stage 2 fieldwork was completed in February 1998 and reporting on the work and developing safety assessments were finalised by the end of 1998. On completion of the 1997/98 investigations and interpretation a further safety assessment will be performed and this will form the basis for the decision concerning the suitability of the selected site for an underground repository for L/ILW and whether it merits further, more detailed site characterisation which may start from 1999 (stage 3).

SPENT FUEL MANAGEMENT STRATEGY

Based on bilateral agreements, the original approach for all of the WWER owners was to transport the spent fuel to the former USSR following several years (typically 3 to 5 years) of

spent fuel cooling in ponds located close to the reactors. It was not foreseen for any of the reprocessing wastes to be shipped back to the countries where the spent fuel originated. Following USSR dissolution at the end of 1980s it became more and more difficult to transfer spent fuel to Russia and eventually almost impossible by the mid 1990s. Russian and partly Ukrainian spent fuel from WWER 440 reactors is still reprocessed by the enterprise MAYAK where storage capacity for reprocessing waste and spent fuel before reprocessing is sufficient. The other WWER owners had to increase their own storage capacities through building additional spent fuel interim storage facilities developing technologies for spent fuel reprocessing/conditioning and preparing for disposal.

In Hungary the likely interruption of the spent fuel reshipment lead to a fairly immediate problem in 1995. The spent fuel ponds became nearly full by the end of the year. With storage space in its spent fuel pools running low, and future acceptance of spent fuel by Russia under previous conditions became uncertain, the Paks NPP awarded a contract for the construction of a modular vault dry storage (MVDS) system at the NPP's site. The Hungarian Atomic Energy Commission issued a license in February 1995 for its construction and in February 1997 for the commissioning of the facility.

By the end of December 1997, 450 spent fuel assemblies were loaded to the MVDS. The next phase has begun: the construction of the next module with a capacity for 1800 spent fuel elements. This construction work will be finished by the end of 1999.

In order to ensure the reliable operation of Paks NPP the currently existing interim storage facility has to be kept in operation and its extension – as need arises – should be accomplished. The total capacity of this interim storage facility will be enough for all the spent fuel elements generated during the full operational time of the Paks NPP.

PROGRESS TOWARDS IMPLEMENTATION OF DEEP GEOLOGICAL DISPOSAL

The strategical plan approved by the Hungarian Atomic Energy Commission stipulates the milestones for geological disposal of long-lived radioactive waste.

By 2040 in Hungary the final disposal facility – serving either for direct disposal of the spent fuel assemblies or of the high activity waste produced by reprocessing and packed into containers – has to be commissioned. The 50 years available till this time – according to the foreign experience – will be both enough and required for thorough preparation of the construction. The time required both to construct the disposal facility and for pre-construction detailed surveys and design work – that are to be accomplished only for the selected area – are assumed to be some ten years each. The geological “screening” covering more potential locations that precede the final selection takes approx. 20 years. To get accomplished the activities above the same time will be needed in Hungary, so the preparations are to be made in the nineties. Accordingly, the preparatory work on the site selection has already begun.

SELECTION OF CANDIDATE SITES FOR HLW

The investigation has started by studying of the geological formation named Boda Claystone Formation (BCF), located on SW-Hungary, west of the city of Pécs. The reason for the site selection without any preliminary, countrywide screening were as follows:

- BCF dips under a uranium-ore-bearing sandstone formation mined for 42 years. Utilizing the facilities and infrastructure of uranium ore mine it was possible to explore the formation relatively quickly at the depth of 1050 m below ground surface.
- As a result of geological exploration connected to the uranium ore mining the BCF is located in the most studied area of the country. The amount of information regarding the potential host rock and its geological environment already exceeded the knowledge level of any other potential formations.

The works aimed at the qualification of BCF proceed in good investigation situation because of favorable geometry. The BCF is a sedimentary rock formation of Late Permian age, which is known from more than 150 km² area. Inside the 50 km² affected by detailed investigation, its thickness is between 700 and 900 m, as verified by boreholes.

The objective of the just finished short-term characterization program (1996-1998) was to consolidate the information before starting the long-term program before a final disposal site is approved. At present, the existence of the access tunnel from the uranium mine into BCF at 1100 m depth provides an unique opportunity to conduct in-situ investigations.

About 50 boreholes were drilled from surface to investigate the uranium deposits in the sandstone. Four boreholes have penetrated the underlying Boda Claystone Formation to considerable depths (a few hundred meters). Two of thee boreholes were drilled to 1200 m depth to obtain information about the vertical characteristics of the claystone for most of its thickness. The investigations so far from an exploratory tunnel and the two previous deep surface boreholes, indicate that the Formation is a highly compact rock unit of very low overall permeability ($<10^{-10}$ m/sec).

Based on the investigation of faults, fractures and their relative movements by studying the overlying uranium bearing sandstone, it is believed that most of the faults in the claystone area sealed and filled by calcite, barite, gypsum and clay minerals. So far, the data suggests there are only a few broad fault zones crossing the Formation.

The region of the BCF that has been identified as a potential siting area will require a comprehensive characterization program to select a preferred disposal site. The existence of the access tunnel from the uranium mine into the Boda Claystone formation at 1100 m depth, provides an opportunity to characterize some potentially important vertical tectonic structures that could act as groundwater pathways through the claystone.

The characterization activities are part of a long-term characterization program that could take 7 to 15 years to complete, before a final disposal site in the Boda Claystone is approved. However, there is a need to determine whether or not a long-term program should be initiated in the Boda Claystone.

The data obtained by the recent investigations and those collected by various Hungarian institutions can be used to select a preferred site for a high-level waste repository within the potential siting area. There are two possible alternatives that would affect the characterization program. They are:

- the preferred site is close enough to the uranium mine so that it can be accessed from it, or
- the preferred site is located such that new access from the surface would be necessary or preferred.

If the preferred repository site is located away from the existing uranium mine where new access from surface is required or preferred, the characterization will initially be mainly from the surface at the undisturbed portion of the Boda Claystone Formation and will progress logically to underground characterization as new underground access is constructed.

Decision on the program continuation is planned to be made soon. In the future greater attention also is being given to the international co-operation in the HLW management.

PUBLIC INVOLVEMENT

There is a formalized process for public participation in decision making related to waste management in Hungary.

The Act No. LIII. of 1995 on the General Rules of Environment Protection and its executive orders regulate the participation of the public in the licensing process of all facilities – among others radwaste repositories – having impact on the environment. Beyond these rules the Act on Atomic Energy requires that fundamental scientific, technical knowledge and other information – including risks – related to the application of atomic energy shall be educated and disseminated to the public through public news services and through public education.

In order to regularly provide information to the population of the communities in the vicinity of the facilities, the licensee of a nuclear power plant as well as that of a radioactive waste disposal facility shall promote the establishment of a public control and information association and can grant assistance to its activities.

Apart from the legal requirements it is of particular importance to obtain widely based social understanding and support for the efforts being directed towards realising safe waste disposal. The biggest challenge for experts and scientific community in how to raise the level of social trust in its ability to understand the potential environmental impact.

In 1992 an Information Association was established with the participation of 13 villages located within 12 km radius of Paks NPP. The main objective was to gain confidence and acceptance for the construction of the interim storage facility for spent fuel.

Similarly, the highest priority has been given in the L/ILW Project for the public relation issues. A professional PR company was contracted to carry out the communication tasks during realisation of the Project.

The public relations campaign was planned to be carried out on three levels such as general public, special groups (government, media, environmentalists, anti-nuclear activists), and the population of the areas found suitable for the construction of the disposal facility. A national

information programme was carried out to clear up the misconceptions about nuclear energy in general and the disposal of radioactive waste in particular.

Regarding the local public relations activities, the fundamental aim of all actions, events and programmes was to establish a long-term relationship between the local communities and the nuclear power plant and to continuously keep the local residents interested and confident in the development.

During the L/ILW Project implementation letters inviting indications of interest were sent to all municipalities. This first letter was only introductory and informing the mayor about the Project, nothing had to be decided on. Great emphasis was put on explaining to them that the repository unit will only be built in a village where most of the residents agree to it.

Those, who formally expressed interest were involved in the next phase of the disposal Project and the siting process. Through a consultative process, attempts ensure that all interested and potentially affected people were fully informed and were given the opportunity to express their views and have their concerns addressed. Later information sessions were conducted to describe the major elements of the process. The emphasis at these information sessions was on explaining the nature of the radioactive materials to be disposed of, the potential risks, and the role of the community in the process.

Having the geological feasibility taken into account, by narrowing the surveyed area, the field work began at three sites of the municipalities expressing willingness for acceptance. Resulting from these studies, the management of the Project selected the Űveghuta site, where the geological site characterisation started for L/ILW repository.

The municipalities – with the aims similar to that of the Information Association – founded their own Social Association for Control and Information, under the TETT acronym. Since its establishing, this Association regularly follows with close attention the investigations and provides information to the public.

During the preparatory activities for HLW disposal, the municipalities of the surveyed area also were grouped, and formed the West-Mecsek Information Association. By this way very early stage of the investigations, a direct relation was established with the inhabitants involved.

CONCLUSIONS

The new Act on Atomic Energy provided a new framework for activities with regard to the nuclear waste management.

By setting up the Agency, the problems connected to the radioactive waste management have found their “legal owner”. The appointment of the owner will not solve the problem in itself, but at least it is true that the cast of the play is done, so the systematic work may continue in a well defined framework.

According to the Act, the nuclear waste producers are responsible for safe management of the waste they have produced. It is also their duty to collect money in the price of nuclear electricity and to set it annually aside in a fund.

Hungary with existing disposal facility is improving the operation to enhance its protective capability and to meet new regulations. Safety assessment will be done as part of overall reviews of the performance of the existing repository.

With a plan to start operating of a new repository for L/ILW of nuclear power plant origin by the year of 2003 or so, the site investigation program was started in 1993. A key features of the siting process is the voluntary participation of the located communities. Currently a mined cavity disposal system in granite seems to be a feasible option, but further exploration is needed to confirm the suitability of the preferred site.

Hungary is to reconsider its back-end policy as a consequence of the internal and external political and economic changes have occurred lately. The formerly announced “wait and see” policy while still remain the main strategy, much more emphasis are to be placed on the preparatory activities such as extension of interim storage of spent fuel and site investigations of a HLW repository.

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