Management of Disused Radioactive Sealed Sources in the Slovak Republic - 12100

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ABSTRACT

After splitting-up the Czechoslovak Federation in 1993, the system of management of institutional radioactive waste, where disused sources represent its significant part, had had to build from beginning, since all corresponding activities had remained in the Czech part of the Federation. The paper presents the development of legislative and institutional framework of the disused radioactive sealed source management, development of the national inventory and development of management practices. According the Governmental decision (1994), the management of disused sealed sources and institutional radioactive waste at whole was based on maximal utilization of facilities inside nuclear facilities, particularly in the NPP A1 (shut down in the past, currently under decommissioning). This approach has been recently changing by Governmental decision (2009) to construct "non-nuclear facility" – central storage for remained disused sealed sources collected from the places of use, where they were stored in some cases for tens of years. The approaches to siting and construction of this storage facility will be presented, as well as the current approaches to solution of the disused radioactive sources final disposal.

INTRODUCTION – HISTORICAL OVERVIEW

Before dividing the Czechoslovak Federation on January 1st, 1993, the Czechoslovak Atomic Energy Commission entrusted the former Institute for research, production and utilization of radioisotopes in Prague with distribution of radioactive sources as well as with certification of sealed sources after their standardized testing and also with the central collection after termination of use. The centralized system was enforced by the radiation protection legislation being in force at this time. The system was interrupted by economical consequences of political changes in 1989 and, particularly, by separation of the Federation. All activities regarding centralized collection and further management of institutional radioactive waste, including disused sealed sources, left in the Czech Republic.

Next development in the Slovak Republic can be briefly described as following:

- 1993-4: long-term negotiations of involved state bodies, i.e. both of regulatory authorities (predecessor of current Public Health Authority of the Ministry of health for radiation protection, Nuclear Regulatory Authority for nuclear safety), Ministry of Economy and the Slovak Electric State Company (at this time), Ministry of Finance, Ministry of Environment and the Ministry of Interior) led to the Official Governmental

Decision (No. 190/1994, which established the first national strategy of radioactive waste and spent fuel management, in fact) based on the only immediately real option: utilize existing facilities and devices inside nuclear power plants also for purposes of the institutional radioactive waste and disused sealed sources management after their centralized collection. The Official Governmental Decision was followed by next two:

- 538/1995 on Governmental measures against illicit trafficking of nuclear and radioactive materials,
- 537/1997 on assignment of "storage of contaminated materials within the Slovak Republic" to the Slovak Electric company, particularly its branch called "Decommissioning of Nuclear Facilities" (SE-VYZ, o.z.),

and led into the letter of State Secretary of the Ministry of Economy (March 1998) officially entrusting the Director General of the Slovak Electric Company with "ensuring the realization of the institutional radioactive waste disposal conception, ensuring the system of management, surveillance and disposal of captured radioactive materials and ensuring temporary disposal of contaminated materials in SE-VYZ, o.z." In the letter, the Director General was also charged with "withdrawing of radioactive materials captured in environment and institutional radioactive materials, ensuring their treatment and final disposal".

- the first Atomic Act of the autonomous Slovak Republic (No. 130/1998 Coll.), as well as the radiation protection legislation entered into force at this time established only the competencies of both regulatory authorities in the institutional radioactive waste management chain, not the system itself.
- Nuclear Regulatory Authority approved (by the Official Decisions No. 228/2000 and 246/2000) the storage of centrally collected disused sealed sources in specified storage channels originally aimed to store the outputs of vitrification technology at NPP A1 (under decommissioning) in Jaslovske Bohunice, under conditions established in the applicant's safety documentation, i.e. under limitations regarding radionuclides, their activities, surface dose rate at the top of storage channels.
- 2001/2: Elaboration of the study on management of spent sealed radioactive sources in Bulgaria, Latvia, Lithuania, Romania and Slovakia [1]. Regarding the Slovak part of the study, it was concluded and recommended:
  - The government should consider appointing one ministry to be responsible for all aspects of the management of radioactive waste, including institutional waste and spent sealed radioactive sources. The responsible ministry needs to put into place the necessary legislative and contractual arrangements to enable one agency to provide a national disposal service for spent sealed radioactive sources, using the facilities at Bohunice and Mochovce. The responsible ministry should put into place the necessary legislation to incentivize users to send sealed source for disposal rather than the current situation, where many users perceive there to be more benefit (particularly, financial) in keeping them in temporary storage at their own premises.
  - Financial provision needs to be made for the management, including disposal, of spent sealed radioactive sources from owners that have become bankrupt.

  - Legislation needs to be put into place that requires the users of SRS to contribute towards the funding of all aspects of spent sealed radioactive sources management, including the relevant activities of the disposal agency.
  - Use of the handling, conditioning and storage facilities at Bohunice NPPs and the disposal facility at Mochovce should be made available for dealing with spent sealed radioactive sources as soon as possible to provide an alternative to storage at the users' premises.
  - Outstanding claims on the State Decommissioning Fund for work done for the recovery of orphan sources should be paid as soon as possible.
  - The experience gained by other countries in developing systems for the framework of managing institutional radioactive waste, particularly spent sealed radioactive sources, would be beneficial in creating and establishing a radioactive Waste Management Agency.
- Decision to construct the Integral Storage Facility in Jaslovske Bohunice with intention to store here also centrally collected institutional radioactive waste, including disused sealed sources – 2002; later changed.
- European Council Directive 2003/122/EURATOM on the control of high-activity sealed radioactive sources and orphan sources was put into force (31 December 2003).
- 2005: Updating the above-mentioned study [1] and seminar on preparedness the EU Member States on implementation the Council Directive. The Slovak presentation on the seminar [2] declared that Slovak Republic is prepared to fulfill completely the transposition requirements of the Directive, nevertheless addressed two challenges to solve in the next:
  - establishing when the source become disused ("no longer to be used or no longer intended to be used for authorized practice"), i.e. problem of the "out-of-use period" definition,
  - how could be the insolvency or out-of-business situations legislatively covered, i.e. problem of cooperation with the trades licensing legislation.
- 2006: In addition to existing approval for storage of collected disused sealed radioactive sources issued by Nuclear Regulatory Authority, also the Public Health Authority approved the storage of disused sealed sources, institutional radioactive wastes and captured orphaned radioactive materials at storage areas inside the NPP A1 in Jaslovske Bohunice (the validity of the official approval has been expired recently: in October 2011)
- 2006: privatization of the Slovak Electric Company. The SE-VYZ branch was excluded from the privatization and consequently transformed onto the current Nuclear Decommissioning Company (JAVYS, a.s. according to the Slovak acronym), joint-stock company owned by the state
- 2006-8 amended legislation on radiation protection was entered into force and, at the same time, implemented fully the Council Directive. The amended Act on the Public Health (No. 355/2007 Coll.) has stated that a sealed radioactive source which does not have a valid sealed source certificate for a period longer than 12 months shall be considered as disused. Consequently, the executing Regulation of the Ministry of Health No. 545/2007 Coll. has stated that maximum time for storage of institutional radioactive wastes at the workplace of their arising is 12 months (except the

transitional radioactive wastes with the half-life lower than 60 days which can be stored longer for their decay)

- Study “Elaboration of the proposal for improvement of institutional radioactive waste management system in the Slovak Republic” [3]. Establishment of disused sources database as well as considerations regarding disposability of disused sealed sources in near surface repository at Mochovce (operated since 1999 for disposal of radioactive waste from operation and decommissioning of NPPs) were, among others, significant outputs of the project.
- 2007: principal change of the Nuclear Regulatory Authority approach to the storage of institutional radioactive waste, including disused sealed sources, in nuclear facilities (inside the NPP A1, as mentioned) – the authority started to prohibit use nuclear facilities for the given purpose,
- Next studies on the strategy of institutional radioactive waste, including disused sealed sources, management, e.g. [4]. The studies proposed solutions of consequences of the Nuclear Regulatory Authority changed approach on legislative and infrastructural level and proposed to build so-called non-nuclear facility (“non-nuclear” means that that facility is out of the Nuclear Regulatory Authority regulatory functions, so it falls exclusively under regulatory functions of the Public Health Authority)
- Official Governmental Decision No. 610/2009 approving proposals from the above-mentioned studies

SCOPE OF THE PROBLEM

Practice of centralized collection, treatment and disposal or long-term storage of disused sealed sources was functioning before division of the Czechoslovak Federation. All collected disused sources were stored and/or disposed in the current Czech Republic facilities.
Since the end of nineties, the Public Health Authority requires returning spend sources to original distributor or producer after the sources became disused. Besides collection of institutional radioactive waste and reception of captured orphan radioactive materials for storage, JAVYS, a.s. Company performed also a few collections of disused sealed sources on request of their users – up to 2008. Only very limited disused sources of following radionuclides were collected: e.g.: 18pcs. of Co-60 sources with activity approximately 10^8 Bq, 2pcs. of Cs-137 sources with the same activity by order, radioactivity etalons containing Ra-226, Am-241, Sr-90, Cs-137 with activities varied from 10 GBq to 1 kBq.

Therefore, the problem is represented by sealed radioactive sources became disused after amending the radiation protection legislation, as they remained to be stored at the workplaces of their use from nineties. According [3], the following amounts of the sealed sources have been used or stored at the workplaces of their use were estimated: Co-60 (203pcs.), Kr-85 (24pcs), Sr-90 (30pcs.), Ba-133 (8pcs.), Cs-137 (251pcs.), Ir-192 (258pcs.), Tl-204 (4pcs), Ra-226 (200pcs of radiotherapy needles and tubes with estimated total activity 10^{11} Bq, 2000pcs. from the glow lamps), Pu-239 (2pcs), Am-241

(130pcs. without the small activity sources from smoke detectors – their estimated amounts is approx. 20000pcs.) , Am/Be neutron sources (46pcs.), Cf-252 (3pcs.), Ge-68 (6pcs.), Gd-153 (60pcs), Se-75 (6pcs.), Cd-109 (2pcs.), C-14 (1pc.) According to [5], these sources can be disposed in existing near surface disposal facility, following the existing disposal practice (wastes are solidified by cement mortar into the cube concrete containers reinforced by amorphous alloyed steel fibres), with the exception of:

- etalons containing alpha nuclides,
- two higher activity sources of Cs-137 and one C-14 source,
- all neutron sources (Am/Be or Pu/Be) and all sources of Ra-226 (needles and tubes from radiotherapy application, sources from the glow lamps)

ESTABLISHING A NEW INSTITUTIONAL RADIOACTIVE WASTE MANAGEMNT SYSTEM

Official Governmental Decision No. 610/2009 which approves the national strategy of management of institutional radioactive waste, including disused sealed sources, and management of captured orphan sources is based on the construction of the appropriate storage facility. The corresponding Environmental Impact Assessment process is in progress at the present time.

The area from the outside of fence of the National Repository in Mochovce was chosen as the best alternatives for the storage facility siting [5]. Options of detailed emplacement of the storage facility are shown on Figures 1 and 2. According to the alternative 1, the storage facility will be erected together with the repository new administration and public information building (colored by blue in the figure 1) at the repository parking and entrance area. Alternative 2 makes allowance for construction of storage facility separately, behind the northeast corner of the repository territory.

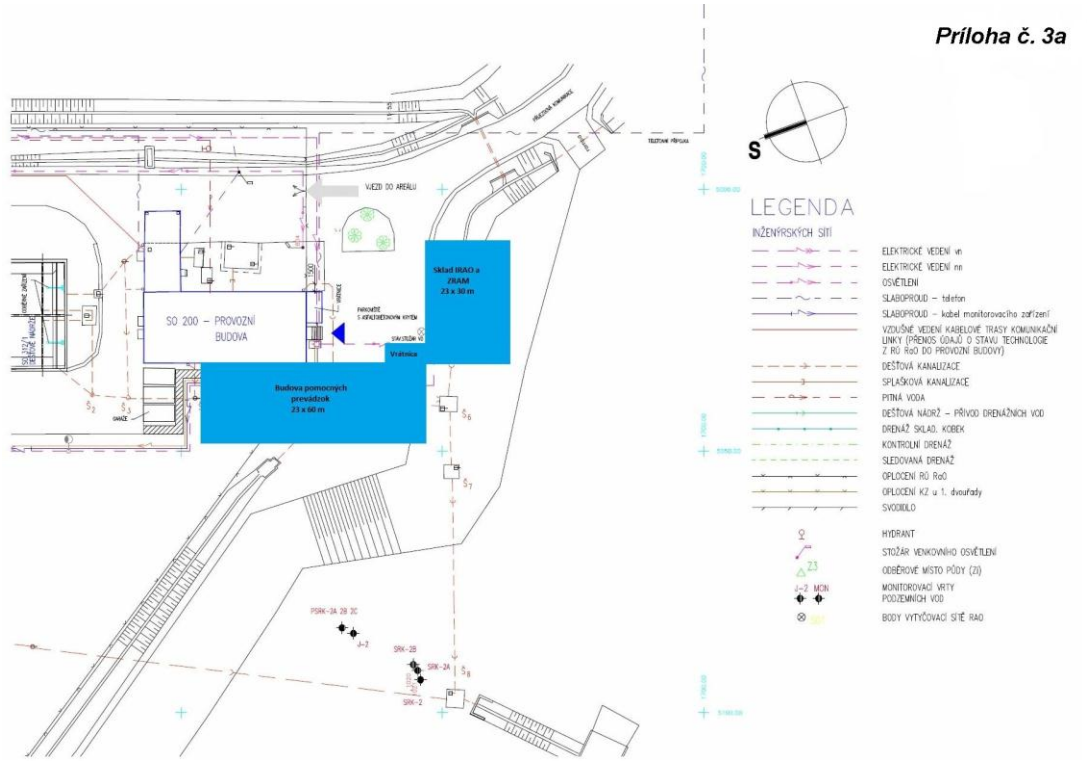

Fig 1. Emplacement of the storage facility – alternative 1

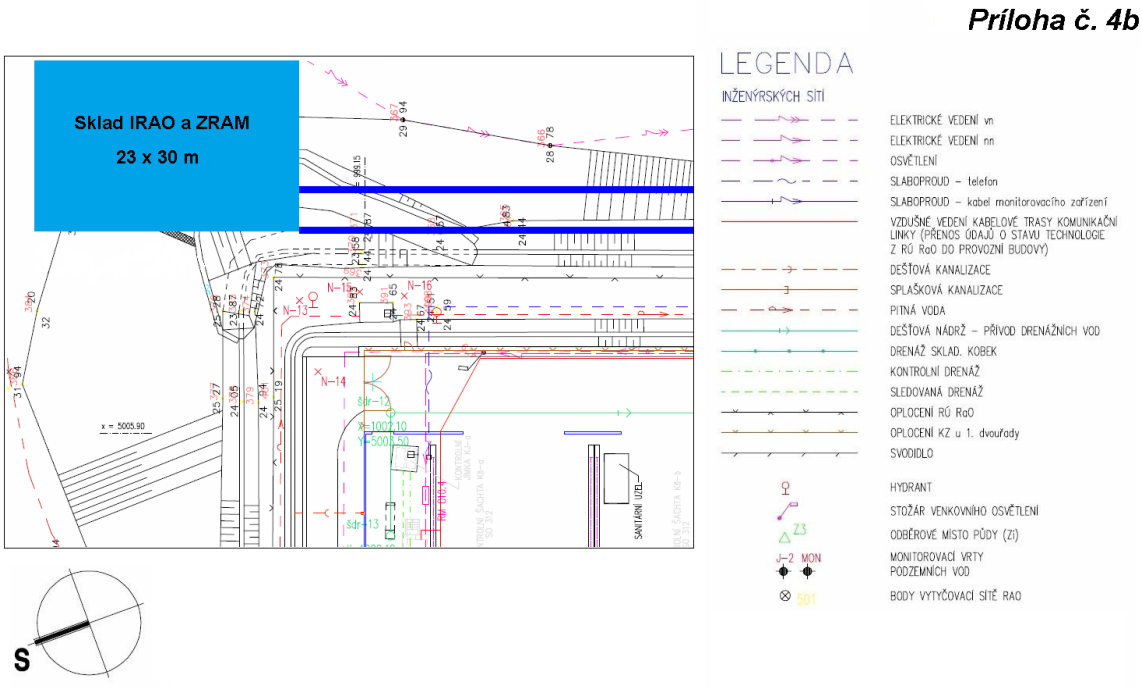

Fig. 2 Emplacement of the storage facility – alternative 2

Dimensions of the storage facility building are planned to be 23x30 m. Only solid or solidified institutional radioactive wastes will be stored in the storage facility, basically in:

- 200-l drums, freestanding or on pallets (the space allows to store of 300 drums),
- cube (outer edge 1.7 m) concrete containers reinforced by amorphous alloyed steel fibres, with inner volume 3.1 m^3 (the space for emplacement of 5 containers is planned here) – such waste package forms are only acceptable for disposal in the adjacent repository at the present time,
- heavy container from depleted uranium for temporary storage of disused sealed sources with higher activity gamma.

Devices allowing handling and manipulation with all packages containing institutional radioactive waste will equip the storage facility. There is also an intention to equip the storage facility by hot chamber, particularly for removing disused sealed sources from devices of their former use. The complex need of the hot chamber will be studied in frame of designing the facility and corresponding safety assessment. Most of the disused sealed sources will be stored here temporarily, before their subsequent disposal in the repository nearby. The long-term storage is planned only for sources not disposable in the adjacent repository, i.e. waiting here for appropriate disposal option.

RECENT DEVELOPMENT AND CONCLUSION

Environmental impact assessment process in regard to the given facility/activity is slowly drawing to a close. The final statement of the Ministry of Environment can be expected in January or February 2012, probably recommending option 1 as preferred [6]. According to the Slovak legislation, the final statement has a status of recommendation for ongoing processes leading to the siting license. Very recently, in December 2012, Government of the Slovak republic decided to postpone putting the facility into operation by the end of June, 2014.

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