

SLOVAK NUCLEAR REGULATORY BODY POSITION IN THE TRANSPORT OF RADIOACTIVE WASTE

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ABSTRACT

This paper describes safety requirements for transport of radioactive waste in Slovakia and the role of regulatory body in the transport licensing and assessment processes.

Importance of radioactive waste shipments have been increased since 1999 by starting of NPP A-1 decommissioning and operation of near surface disposal facility. Also some information from history of shipment as well as future activities are given.

Legal basis for radioactive waste transport is resulting from IAEA recommendations in this area. Different types of transport equipment were approved by regulatory body for both liquid and solid waste and transportation permits were issued to their shipment.

Regulatory body attention during evaluation of transport safety is focused mainly on ability of individual packages to withstand different transport conditions and on safety analyses performed for transport equipment for liquid waste with high frequency of shipments.

During past three years no event was occurred in connection with radioactive waste transport in Slovakia.

INTRODUCTION

Transport as a linking process represents strategic connection and may be necessary between individual steps of radioactive waste management system. Whole system depends on function and reliability level of this connection. Effective radioactive waste management should take the implications of transport into account, too. Items and volume of transports are given by national radioactive waste management strategy, mostly.

HISTORICAL BACKGROUND

Transport of nuclear materials in Slovakia (even in the frame of former Czechoslovakia) has been started in the seventies within the commissioning of the first NPP A-1 at Jaslovské Bohunice. Fuel assemblies were transported from the former USSR. Due to the lack of legislation in that time all transports were approved by former Czechoslovak Atomic Energy Commission using IAEA recommendations incorporated into (1). Unfortunately no legal document describing in details requirements on transport of nuclear materials has been issued. After splitting of Czechoslovakia in 1993 the activity in the area of nuclear materials transport are regulated by Nuclear Regulatory Authority (NRA).

The original soviet design concept for the waste management at Slovak NPPs supposed the collection, pre-treatment and interim storage of all radioactive waste produced at the site during whole operational period of NPP. Such concept postponed the final decision on conditioning and disposal of operational waste to the decommissioning stage with the goal to proceed radioactive waste from both operational as well as decommissioning period together. Waste collection and storage systems were designed for 10-years waste production with possible extension of capacities. It was main reason that almost no transports of radioactive waste have been realised in the past. Another reason was the fact that all nuclear facilities in

Slovakia have been allocated in one common site until Mochovce NPP and repository construction. The prevailing part of transports of nuclear materials was represented by transport of fresh and spent fuel.

CURRENT STATUS AND FUTURE ACTIVITIES

At present the importance and number of radioactive waste transports have been increased by starting of NPP A-1 decommissioning and since 1999 by starting of operation of repository for low and intermediate level waste at Mochovce. Recently, transports of radioactive waste create more than 60 % of all transports of radioactive materials.

Concerning future shipments radioactive waste from NPP A-1 decommissioning will entail many transports. Both liquid and solid waste will be transported to technologies serving for their further treatment and conditioning or in the case of radioactive waste non-acceptable for near surface disposal to their storage, respectively. After final conditioning the packages with low and intermediate level waste from decommissioning process will be transported to repository for disposal.

According to Slovak national strategy for radioactive waste management established by (2) which is supposing also conditioning of operational radioactive waste into form suitable for disposal or long term storage the part of future shipments will take transport of such radioactive waste. Resulting from Strategy for radioactive waste management mentioned above the current disposition alternative available for low and intermediate level waste is disposal in Mochovce repository. For radioactive waste non-acceptable for near surface disposal their conditioning into the proper safe form and their long term storage is considered. The project of deep geological repository is under preparation for such kind of waste.

Concerning future activities of NRA in this field, decisions on permit for transportation of radioactive ashes, sludge and ion-exchange resins are under preparation to enable transport of such kind of radioactive waste to treatment and conditioning technologies.

General overview

In general, radioactive waste is transported through special-purpose roads in the premises of nuclear facilities (before further treatment, conditioning as well as storage) or out of the nuclear site (for disposal), respectively. Concerning radioactive waste non-acceptable for near surface disposal even one type of transport will remain to realise after long term storage period (to deep geological repository). At present no radioactive waste is transported out of Slovak territory even if such possibility is given by legislation in connection with radioactive waste conditioning abroad.

Liquid radioactive waste is transported at nuclear facility via pipelines. With advantage this transport mode is applied among different installations inside of one nuclear site, mainly in the case of small distances. Typical example in Slovakia is pipelines connection between individual technologies for treatment and conditioning of liquid radioactive waste at Jaslovské Bohunice, for shipment of radioactive concentrates, ion-exchange resins and sludge. It is transported in the packaging only if its transport via pipelines is not feasible either in technical or economical terms.

LEGISLATION

Transport regulations are defined by legislation very precisely in world-wide and they are resulting mainly from IAEA recommendations as well as different international agreements (ADR, CIM, RID, etc.). From transport point of view radioactive waste is transported as

dangerous goods, class 7. These recommendations and agreements are followed by Slovak national legislation.

Slovak legal basis

Transport of radioactive waste is determined by (3) which states that all radioactive waste transports may only be carried-out only on the basis of NRA decision. According to provisions of (3) the regulation (4) was issued by which both on-site and off-site transport are regulated. Resulting from (5), this regulation defines transport safety requirements as well as content and scope of documentation to be prepared by consignor as an attachment of his request. The provisions of (4), regulating the process and method of radioactive waste transport, also apply to transport of institutional radioactive waste, from the place of conditioning to the place of disposal, because of the fact that only this part is under NRA responsibility.

There should be assured that radioactive waste transport will be managed to as to minimise the effect of ionising radiation exerted upon staff, public and environment. During transport, along with radioactivity also physical, chemical and biological properties of the radioactive waste are taken into account, such as toxicity, inflammability, explosiveness and other hazardous properties thereof, which might have impact upon transport safety.

LICENCING PROCESS

Licensing process is running in two principal steps. The first one is an approval for type of transport equipment used, which is representing the main condition for the second decision, i.e. for transportation permit.

Transport equipment type approval

The application for approval of the transport equipment should be enclosed with package design, which should contain identification data of carrier or consignor, unambiguous identification of the transport equipment, detailed description of proposed radioactive content with reference to its physical and chemical form and nature of radiation emitted, detailed construction data and list of materials and manufacturing procedures that will be applied. Also protocols on tests made and results of such tests, proposed operating instructions for use and maintenance, and quality assurance programme with set of measures for quality assurance of a project, manufacturing, tests, use, maintenance and inspections should be included. Decision of NRA on approval for type of transport equipment is issued on the basis of reviewing of introduced safety documentation and as a result of evaluation of compliance with respective technical specifications given by (4).

Shipment permit

A permit to transport radioactive waste shall be issued to the consignor or carrier for each transportation. This permit may be issued for transportation of radioactive waste of the same type by the same carrier for a longer period of time, but not more than one year. Due to mentioned restriction the permits are prolonged that allows to re-evaluate and to modify their conditions.

PRACTICAL IMPLEMENTATION

On the basis of approach mentioned above seven types of transport equipment were approved by NRA for both liquid and solid radioactive waste as well as respective transportation permits were issued for transport of radioactive waste among individual treatment technologies or to the Mochovce repository, respectively. Preview of approved transport equipment in connection to type of package and to kind of radioactive waste transported is given in Table I.

Table I. Preview of transport equipment approved for radioactive waste shipment in Slovakia

Transport equipment	Type of package	Type of radioactive waste	Specification of content
200 l drum	IP – 2	solid and solidified	LSA-III
20' ISO container	IP – 1	solid and solidified	in drums
PK I/dow	B (U)	liquid	dowtherm ^a
PK II/sludge	B (U)	liquid	ra-sludge
PK III/drums	B (U)	liquid	contaminated oil
PC-55 fl.	IP – 2	liquid	ra-concentrates
FRC container ^b	A	solid and solidified	conditioned for disposal

^a Organic coolant used for spent nuclear fuel cooling at NPP A-1 in the past (mixture of diphenyl and diphenyl oxid)

^b Fibre-reinforced concrete container used in Slovakia for disposal of low and intermediate level waste

Mode of transport

At present the transport by road is used for all types of radioactive waste. Combination of rail and road transport modes is under preparation for transport of waste packages to the Mochovce repository. This mode of transport is considered as more safe and provides for increasing of transport capacity to the repository.

Shipped radioactive waste

In 2002 almost 570 transports of radioactive waste have been carried-out in Slovakia and 680 m³ of liquid radioactive waste and more than 1 869 t of solid radioactive waste have been shipped. Details are given in Table II.

Table II. Number of transports carried-out and volume of radioactive waste shipped in Slovakia during 2002

Type of radioactive waste	Number of transports	Number of transport equipment shipped	Volume of radioactive waste
liquid	293	293	682,6 m ³
solid and solidified	169	3 364	582 297 kg
for disposal	107	214	663,4 m ³

All transports performed during 2002 were in accordance with conditions of NRA decisions and no event was occurred.

EVALUATION OF TRANSPORT SAFETY

NRA attention during evaluation of transport safety is focused mainly on the ability of radioactive waste packages to withstand different transport conditions and associated calculation methods or tests performed, respectively. NRA is also focused on evaluation of safety analyses for transport equipment with high frequency of transports and for transport equipment for liquid radioactive waste.

Different methods to assess transport risk prior to shipment are used in the evaluation process. Following procedures are taken into account:

- selection of transport routes, when the influence of the ionising radiation associated with the transport on the public is considered,
- probabilistic analyses, in the frame of which the probability of container drop under critical angle, the probability of container drop during manipulations and probability of failures occurrence of the handling equipment are assessed,
- evaluation of human errors, when the training of the staff and manual drilling of relevant activities of personnel are checked.

Inspections during the radioactive waste transport are planed and they will be play significant role in regulatory body supervision activities.

In the frame of evaluation of radioactive waste safety documentation by NRA the attention is also paid on implementation of transport safety documentation. Two documents "Preliminary plan for radioactive waste management" and "Detailed description of radioactive waste management system" constitute description of individual steps of radioactive waste, including transport, serving as evidence providing compliance with regulatory requirements (6).

SAFETY REQUIREMENTS FOR TRANSPORT EQUIPMENT

Requirements on safe and reliable operation of transport equipment are fulfilled in such a way that these transport equipment should be accessible and preconditions for radioactive waste handling, decontamination, control, maintenance and repair are established as well as due to their design will prevent congestion to maximum possible extent and to ensure that potential sediments and deposits are removable (6).

General requirements

Transport equipment should resist mechanical, thermal and corrosion damage and be fire and explosion resistant in case of use of radioactive waste containing inflammable and explosive substances. Permanent on-going or regular measurement of values, providing their correct functionality or having influence upon their explosion or inflammation should be performed. Transport equipment should correspond to the type and volume of radioactive waste transported and it should be protected against over-fill, whereby filling is monitored. On the external surface of packaging, each package should be legibly and durably marked with necessary data (6).

Package test procedures

Transportation package testing requirements are given by (4) based on (5). Scope and content of tests is depending on type of package and concrete shipment conditions. Generally, the

demonstration of compliance with the performance standards can be accomplished by carrying-out of tests with specimens or prototypes, by reference to previous satisfactory demonstrations of a sufficiently similar nature, by tests with models as well as by calculation, or reasoned arguments, when the calculation procedures and parameters are generally agreed to be reliable or conservative.

SAFETY DOCUMENTATION ITEMS

Due to requirements of (4) the safety documentation submitted for issuing of transport permit should contain program of health protection from adverse effects of ionising radiation. Transport procedure including emergency transport procedure are prepared, describing, in particular, the information on package specifications, transport routes, method of driving and communication, process of hand-over consignment as well as on functions, obligations, rights and duties of persons involved and necessary activities for events solution.

Appropriate quality assurance programmes for transportation process are elaborated in order to improve safety level through the using of proper organizational principles and measures for control and handling of package during transport, loading and unloading; management of documentation; training of personnel; evaluation of transport and application of results. Program of physical protection of consignment should contain the information on effective measures against theft of the transported radioactive waste or against interruption of transport aimed on releasing the transported radioactive waste to the environment. From transport physical security point of view, radioactive waste is classified into three categories as other nuclear materials, depending to his activity, amount and different dangerous properties.

MAIN OBLIGATIONS OF LICENCE HOLDER

Holder of transport permit should inform NRA at least five working days in advance, on the exact date of transport, immediately on any malfunction or damage of the package or empty packaging, on any leak of radioactive waste from the package or packages, and on any attempt to interruption the transport or to steal radioactive waste from the consignment. Written report to NRA with evaluation of the realised transport should be send, not later than 14 days after realisation of the transport (4).

Record-keeping system for radioactive waste transport should contain accompanying sheets of radioactive waste transported and records on results of analyses or tests made. Licence holder should keep operational data, records on transport equipment maintenance performed and on events if any for time period stipulated by NRA (6).

CONCLUSION

From volume as well as number point of view the radioactive waste transports are very important. Often they are performed out of nuclear facilities premises therefore they influence extensive areas and a lot of citizens around transport routes. To fulfil all conditions the over standard measures are adopted. Great attention is paid to transport issues in the Slovak republic from regulatory bodies and responsible persons involved.

REFERENCES

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