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OPERATIONAL SAFETY ANALYSIS STATUS OF NOVI HAN REPOSITORY

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Introduction

This article presents the status of the safety studies and activities related to Novi Han repository. The case of this facility is such that no clear boundary exists between post-closure safety assessment and operational safety assessment. The major findings of these activities are given next.

A post-closure safety assessment of the Novi Han

There are a lot of documents with detailed description of the Novi Han repository, but the most comprehensive one is the report on the CEC PHARE project "Radioactive Waste Management in Bulgaria" [1]

The 12 month project, which started in February 1996, was carried out by a consortium, comprising Cassiopee (a grouping of the national radwaste management agencies of France, the United Kingdom, the Netherlands, Spain and Belgium), AEA Technology of the UK, SGN of France and Risk Engineering of Bulgaria. In addition, the London and Sofia offices of Price Waterhouse have provided expert financial advice.

The following findings were presented in the report:

- A review of the current position of radwaste management and disposal in Bulgaria:
 - conclusions and recommendations regarding:
 - ⇒ the Novi Han facility,
 - ⇒ wastes arising from NPP Kozloduy,
 - ⇒ the development of a new National Disposal Facility.
- Addressing organisational and financial infrastructure aspects:
 - conclusions and recommendations regarding:
 - ⇒ a proposed new Waste Management Organisation;
 - ⇒ financing radwaste disposal and decommissioning.

There was a delicate statement in the report that Novi Han may not meet current International standards and guidelines for repositories.

A post-closure safety assessment of the Novi Han site was performed in the report. In this assessment were addressed the consequences from the potential release of radionuclides to the environment from the site for a series of repository management options and radionuclide pathways. For the first time the radiological risks to present and future generations from the release of radionuclides from specific waste emplacement areas at the site were assessed such as:

- Liquid waste storage tanks;
- A solid waste storage vault;
- A biological waste storage tank;
- A sealed source storage vault;
- An engineered trench facility.

It was also considered whether these areas should continue to be used in the future and had addressed a number of management issues together with the question of whether the site should remain open, pending the start of operation of a new disposal facility. The conclusions and recommendations for each of these aspects were presented.

A probabilistic safety assessment was carried out in which were considered the consequences from the potential release of radionuclides to the environment from the site for a series of scenarios and release pathways described below.

Groundwater Pathway

Human Intrusion Scenario

Gas Pathway

Seismic Events

As human intrusion has been identified as the most important pathway, it was **recommended** a more comprehensive evaluation of appropriate exposure scenarios, which should include an examination of how intrusion risks may be minimized

It was also **recommended** that retardation parameters should be evaluated for the Novi Han geology using a range of experimental and theoretical modelling techniques.

This safety study also shows that it would be acceptable to dispose of more liquid and solid wastes to the site but it was strongly **recommended** that no more spent radioactive sources or Plutonium Contaminated Waste should be sent there.

For the first time the problems with the radioactive waste management in Bulgaria were investigated from all possible aspects:

- technical
- institutional
- financial
- training
- public relation

Operational safety analysis of the Novi Han

In accordance with the existing legislation in Bulgaria one of the important factors for licensing of the facilities like Novi Han is the preparation of the Safety Analysis Report (SAR) for the site.

In March 1996 a project for preparation of SAR for Novi Han [2] was started by Risk Engineering Ltd under a contract with CUAEPP. In accordance with the terms of reference the scope of this study covered the existing situation until the filling of the solid wastes vault. There were significant difficulties during preparation of SAR due to the level of legislation rules in the 50-s when the design was prepared.

The findings and conclusions from [1] were widely used in the study as well as the national and international experience in the area of radioactive wastes storage and management.

The report was structured in three sections corresponding to the different phases of the study.

In section I is given existing information and data.

In section II a safety analysis was performed.

In section III are given the conclusions and recommendations.

Due to the specific status of the SAR for Novi Han, as it is shown at the end of this publication, only the general structure and main conclusions and recommendation will be given without discussion on particular issues. There are no numeric results and detailed discussions on particular items. However, the steps of the study follow strictly the requirements of legislation base for this area in Bulgaria: the law of atomic energy, its regulations and all related legislation acts.

The detailed structure of the report is given in the next Table

<i>Table SAR structure</i>			
Section	Title	Chapter	Title
I	Detailed description of the site, wastes and storage criteria	1	Radioactive wastes inventory in Novi Han
		2	Detailed site description
		3	Storage safety criteria
II	Safety Analysis	1	Methodology
		2	Conceptual model
		3	Mathematical model
		4	Computerized model
III	SAR Results	1	Presentation of the SAR results
		2	Assessment of the input data and final results
		3	Comparison with the safety criteria
		4	Conclusions and recommendations
	Apendixes	1	Input data for Section I
		2	Input data for Section II
		3	Numerical results

A complex procedure for the final selection of the accident scenario was followed. On the base of different calculations, and assessments the following scenario for accident release of the radioactivity to the environment:

1. Dispersion of one waste package during the operation of unloading and storage in the repository;
2. Spill of one waste package during transportation due to the transportation incident on the site territory;
3. Fire accident on the site due to the internal initiator or surrounding forest fire;
4. Radioactivity release from the site through the ground water pathways;

Two variants were calculated for the scenario connected with the storage cells:

1. Operation of the repository continues as it is;
2. The filled cells are closed and sealed;

For the fourth scenario the following variants were calculated:

1. flooded cell during normal operation; Вариант 1 - нормална експлоатация при наводнена клетка;
2. flooded cell after earthquake initiator.

The final conclusion from the SAR is that Novi Han repository can meet national and international safety requirements for such type facility and its normal operation can be restored under the following conditions:

1. The content in the filled cells for solid and biological wastes to be stabilized with concrete solution and the cells to be closed and sealed;
2. In the sealed cells the ventilation should be installed;
3. The vault for spent gamma sources to be closed and sealed;
4. To improve hydro-isolation and ventilation of the partially filled cells;
5. To establish technology for stabilizing of the accepted wastes
6. To minimize the use of the manual operations with the wastes;
7. To build the ceiling construction for temporary waste storage
8. To investigate the structural conditions of the facility equipment materials;
9. To implement a system for monitoring of the equipment status.
10. To improve the document control system for the wastes inventory.

In June 1997 the project was completed successfully and accepted by the Expert Council of CUAEPP. Due to the unclear administrative problems in CUAEPP (the payment was not done) two possibilities exist: to bring up the problem to the court or to keep the report as a property of Risk Engineering Ltd (REL). The second option was selected and now the report is a property of REL and can not be used or referenced without special permission.

REFERENCES

1. Radioactive Waste Management in Bulgaria. PHARE contract BG9107-02-04-01 Final Report, February, 1997.
2. Safety Analysis Report for Novi Han Repository. Risk Engineering Ltd Report RE/D-60, June, 1997.