

DECOMMISSIONING AND DISMANTLING OF THE RESEARCH REACTOR SALASPILS. I. CONCEPTUAL STUDY AND THE FIRST RESULTS.

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ABSTRACT

In May 1995, the Latvian government decided to shut down the Research Reactor Salaspils (SRR) and to dispense with nuclear energy in future. The reactor is out of operation since July 1998.

A conceptual study for the decommissioning of SRR has been carried out by Noell-KRC-Energie- und Umwelttechnik GmbH at 1998-1999 years.

The Latvian government decided in October 26 1999 to start the direct dismantling to "green field" at 2001 year.

The first decommissioning and dismantling results from preparation measures in 1999 year are presented and discussed. The main efforts was devoted to collecting and conditioning of "historical" radioactive wastes from different storages outside and inside of reactor hall. All non-radioactive equipments and materials outside of reactor buildings were free-released and dismantled for reusing and conventional disposing. Weakly contaminated materials from reactor hall were collected and removed for free-release measurements.

1.0 INTRODUCTION

The research reactor IRT in Salaspils site near the capital of Latvia - Riga was put into operation on September 1961(see Figure 1.1). The research reactor was originally built according to former USSR design as a pool type light water-water reactor with nominal thermal power 2 MW.

Since 1975, after physical reconstruction of the reactor, the nominal thermal power of reactor was increased up to 5 MW.

In May 16 of 1995, the Cabinet of Ministers had made the Order No. 263 to shut down the Salaspils Research Reactor (SRR) after last 2 years of operation (the decision prohibited obtaining fresh nuclear fuel) and requested the Nuclear Research Centre of the Latvian Academy of Sciences to start the preparation of Concept for decommissioning. The operation license for SRR was awarded until end of 1999.

The relevant technical co-operation project on decommissioning the research reactor was submitted to IAEA for 1997/1998 years. There are 5 expert missions from IAEA were from July of 1997 up to June 1998 year. According to the Order of Ministry of Environmental Protection and Regional Development from 12.01.1998, the stirring group was founded for promotion of Salaspils NRC reorganisation and reactor decommissioning studies.

In 19 June of 1998 year, the reactor was out of operation and some assemblies were removed from the core. The Salaspils NRC was on the control of Ministry of Education and Science up to 01.01.1999. According to the decision of Government of Latvia, the Salaspils NRC will be reorganised up to 01.01 .1999 into Reaktors Ltd., units of University of Latvia and Laboratory of Metrology.

Firm PREUSSAG NOELL started the Salaspils NRC decommissioning and dismantling conception studies in July of 1998. The results of studies ([Noell 1999, Noell 1998) were presented in March 10 at Ministry of Environmental Protection

and Regional Development (MEPRD). Prepared concepts were used for the Order No. 57 of Cabinet of Ministers in October 26 1999, which accepts the option to direct dismantling of SRR to "green field" with start of decommissioning and dismantling procedures in 2001 year. Decommissioning of SRR is studied in report by Cross (1999).

2.0 CONCEPT FOR DECOMMISSIONING AND DISMANTLING OF SRR

The accepted concept consists on several important conclusions and objects. This concept will be used for preparation of the project of decommissioning and dismantling of SRR in future.

The most important conclusions are listed below:

- 1 SRR is erected in a geographical region with earthquakes up to level 6 on Richter scale, but is not designed for the corresponding loadings;
- 2 A final disposal for irradiated fuel or a contract for the transport to other countries does not exist at present time. Therefore an interim storage for irradiated fuel elements in Latvia is necessary;
- 3 A final disposal for radioactive waste is available in Latvia and in operation;
- 4 The conditions is the best strategic for the decommissioning of SRR considering economical and safety aspects;
- 5 Approximately 2200 t of different materials have to be treated. Approximately 60% of them can be measured for free release; the rest has to be conditioned for final disposal;
- 6 The required techniques for decommissioning and dismantling of SRR as well as for the fuel reloading are available on the international market;
- 7 The estimated costs for the total dismantling to "green field" conditions amount to ECU 17-20 million (price base is 1998).
- 8 The dismantling can be done within 9 years.

2.1. Time schedule

Central point in the time schedule is the reloading of the existing fuel elements into transport and storage casks, which for cooling reasons is possible in 2003 earliest. All buildings, systems and components, which are required for the safe storage of the fuel elements, have to be kept in normal operational conditions until the reloading has been finished.

On basis of these boundary conditions, the following phases can be distinguished:

Phase 1 Preparation Measures (1999-2000)

- Execution of a sampling and analysis program to complete the radiological information about SRR;
- Establishing of a suitable decommissioning organization;

- Preparation of basic documents, like the dismantling manual or the work instructions for waste treatment and radiation protection;
- Training program for the Latvian staff in the areas of decommissioning and dismantling technologies, waste treatment and disposal as well as radiation protection and work safety;
- Execution of first measures at SRR, like the clearing of the outside waste interim storage and the reactor building

Phase 2 Design and Licensing (2001-2002)

- Detail design of the decommissioning, the spent fuel handling and the fuel interim storage
- Preparation of the required licensing documents
- Execution of the licensing procedure

Phase 3 Modifications and Erection of new Equipment (2002 - 2004)

- Installation of handling equipment for spent fuel
- Reconstruction of the personnel bomb shelter as interim storage for spent fuel
- Modifications of infrastructure at SRR (e.g. streets, buildings, sanitary equipment, ventilation)
- Erection of new required systems (e.g. fire detection and protection, material hatch)
- Erection of dismantling and waste treatment equipment (e.g. dismantling tools, decontamination and conditioning equipment)

Phase 4 Dismantling Part 1 (2003-2004)

- Dismantling of no longer required systems (e.g. experimental equipment, laboratories, second and third cooling circuit)
- Waste treatment and disposal
- Free release measurements

Phase 5 Fuel removal (2004)

- Fuel removal from reactor
- Packing into transport and storage casks
- Transport to the interim storage
- Disposal in the interim storage

Phase 6 Dismantling Part 2 (2004-2008)

- Dismantling of all systems and components (e.g. primary cooling circuit, ventilation, canalization)
- Dismantling of reactor tank and biological shield
- Waste treatment and disposal
- Free release measurement of reactor building
- Conventional demolishing or reuse of the reactor building for non-nuclear purposes

2.2 Estimation of Decommissioning and Dismantling Costs and Budget Plan

2.2.1 Decommissioning and Dismantling Costs. An estimation of the costs for the decommissioning and dismantling of SRR has been carried out on basis of the existing data. The results are shown in Table 1.

Table 1. Cost estimation (Price base 1998)

Task	Investments in	Orders [ECU]	Total [ECU]
Operation of reactor	2,000,000	—	2,000,000
Overhead	780,000	800,000	1,580,000
Sampling and analysis	250,000	28,000	278,000
Preparation of generally licensing documents	15,000	265,000	280,000
Clearing of waste interim storage and reactor building	111,000	84,000	195,000
Fuel management	365,000	4,700,000	5,065,000
Dismantling	4,300,000	2,100,000	6,400,000
Waste management	1,210,000	400,000	1,610,000
Total	9,031,000	8,377,000	17,408,000

It has to be remarked that the uncertainties within this estimation cannot be neglected. The costs finally will depend on several factors like the results of the sampling and analysis program, the definitive masses and the future development of the price level in Latvia. On this bases, the conclusion has been made, that the total decommissioning and dismantling costs will amount to ECU 17-20 millions .

2.2.2 Budget plan. The budget plan for the decommissioning and dismantling of SRR is shown in Figure 2.1

The following statements can be made:

- The annual costs at the beginning of the decommissioning and dismantling project (1999-2000) are comparatively low and amount to approximately ECU 700,000.00 per year;
- The costs during the licensing phase are higher and amount to approximately ECU 1,940,000.00 in 2001 and ECU 2,780,000.00 in 2002.
- The highest annual investments of approximately ECU 5,560,000.00 are required in 2003, when the necessary additional equipment (fuel handling, waste treatment) will be delivered and the modifications at SRR have to be done.
- Subsequently, the annual costs will decrease to approximately ECU 3,056,000.00 in 2004 (main tasks are the delivery of the transport and storage casks and the execution of the fuel reloading).
- The annual costs during the final dismantling period amounts to approximately ECU 850,000.00 in the years

2005 to 2008 and are comparatively low and will be covered by Latvian side.

3.0 THE FIRST EXPERIENCE OF DECOMMISSIONING AND DISMANTLING

It was described in Chapter 2, that the preparation measures would be performed in 1999-2000 years. These measures in 1999 year were supported from the State budget and Environmental Protection Foundation (EPF). 1999 year was the first year of practical activities for decommissioning of SRR and the first results can be discussed and plans verified now. According to the Order of Ministry of Environmental Protection and Regional Development from 03.02.2000, the stirring group was founded for coordination of decommissioning of SRR.

3.1. Organization of decommissioning of SRR

It was shown (IAEA 1975, IAEA 1977, NEA 1986), that suitable organization desirable promotes decommissioning activities. The ideology of decommissioning elaborated in MEPRD Department of Environmental Protection defines, that responsibility for safe maintenance of rest reactor's systems, radiological protection and security of SRR is a matter of Reactors Ltd., but SE Vides Projekti deals with decommissioning and dismantling of SRR. The stirring group coordinates and State Environmental Inspectorate (SEI) controls all these activities. The principal schema of decommissioning organization is shown in Figure 3.1 and it gives a possibility to carry out all decommissioning measures with necessary control and optimization of investments.

3.2 Execution of first measures at SRR

One of the most important measures was preparation of basic documents: dismantling manuals for removing of further unusable reactor systems and materials outside the reactor's building. Such manuals and working plans were elaborated for disconnecting, free release and dismantling of the second cooling circuit's tower (see Figure 3.2, 3.3). All activities were controlled, verified and accepted by SEI.

One of the first tasks was to cleaning of the territory of SRR from conventional wastes: unused scientific equipments, metallic scraps and another wastes from different labor's rooms (see Figures 3.4, 3.5).

Work instructions for waste treatment and radiation protection also were prepared for dismantling of unused scientific equipments and materials and transportation of these materials for free release measures (see Figure 3.6). Special personal radiation protection means were used for dismantling of radioactive wastes in reactor hall (see Figure 3.7, 3.8). Prepared well-ventilated tent for dismantling and conditioning of radioactive wastes in 1m³ Studvik-type concrete containers was used for removing and conditioning of weakly radioactive

metallic wastes from interim radioactive wastes storage outside the reactor hall. In such way all radioactive wastes outside the reactor building will be conditioned and disposed.

Execution of a sampling and analysis program also was performed to complete the radiological information about SRR. All territory and buildings were tested to check the possible radiation contamination. These data are treated and data basis for all buildings and reactor systems are prepared now.

Additional complex for free release of materials and devices is prepared in former radioactive water treatment facility. All materials and scientific equipment from reactor building must go through this complex (see. Figure 3.9). A new radioactive waste monitor is procured for these purposes. Another one will be supplied by IAEA. The data on working experience with this complex will be referred in future.

4.0 CONCLUSIONS

1. The concept for decommissioning of Salaspils Research Reactor is prepared and accepted for dismantling of nuclear facility up to “green field” in next 10 years.
2. It was found, that decommissioning and dismantling costs would amount to ECU 17-20 millions.
3. Necessary manuals and working plans are prepared now for cleaning of radioactive wastes outside the reactor building.
4. The first practical operations were carried out to clean the territory of SRR from non-radioactive materials and radioactive wastes outside the reactor hall.

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Fig.1.1 Salaspils Research Reactor's building in 1961.



Fig.1.2 Reactor buildings now.

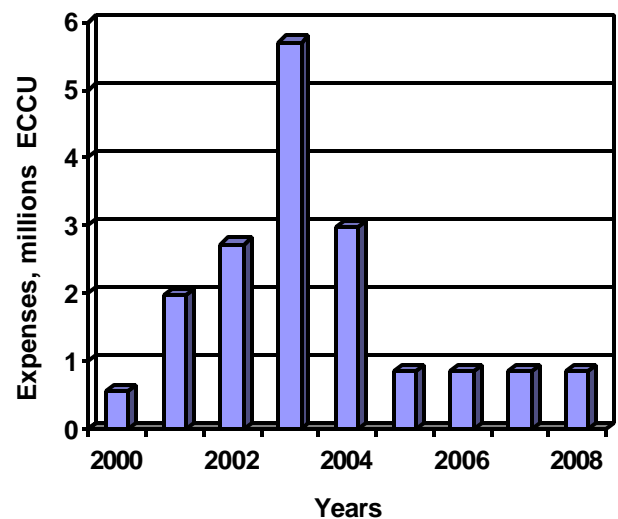


Fig. 2.1 Expenses for decommissioning of Salaspils Research Reactor

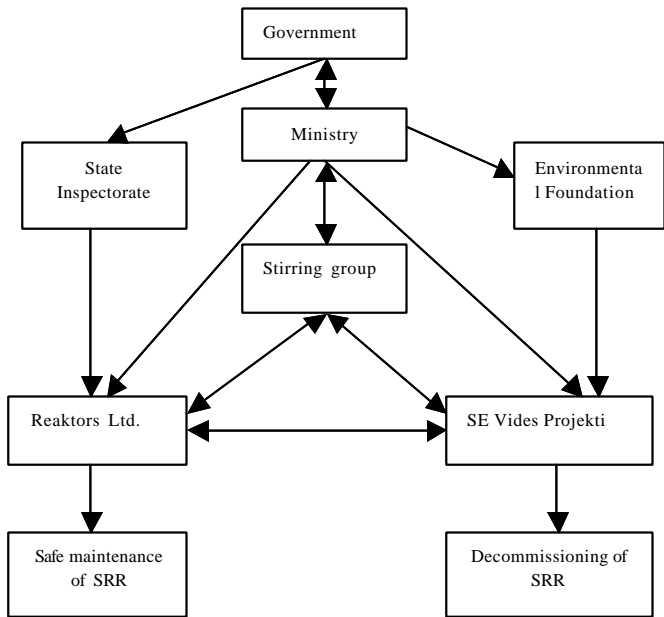


Fig. 3.1. Organization's schema for SRR decommissioning.



Fig.3.4 Conventional wastes at the territory of SRR.



Fig.3.5 Metallic scrap from cutted devices is ready for transportation



Fig.3.2. Reactor's cooling tower in July 1999.



Fig.3.3 Reactor's cooling tower in January 2000.



Fig. 3.6 Dismantling of unused computer building in reactor hall



Fig. 3.7 Equipment of staff for dismantling of radioactive wastes in reactor hall



Fig.3.8 Tent with ventilation device for dismantling of radioactive wastes in reactor hall



Fig 3.9. Dismantled materials and scientific equipment in the free release complex.