

HISTORICAL SURVEY OF NUCLEAR NON-PROLIFERATION IN ESTONIA

I. Maalmann

Estonian Radiation Protection Centre, Estonia

Email address of main author: Iige.Maalmann@ekk.envir.ee

Abstract. The presentation gives an overview about the project initiated in co-operation between the Swedish Nuclear Power Inspectorate (SKI) and the Estonian Radiation Protection Centre (ERPC) to carry out a historical survey of the nuclear activities taken place in the territory of Estonia after the World War II. The main purpose of the project was to create transparency in the State's nuclear related past and to submit the results of the conducted historical survey as a volunteer supplement to the Additional Protocol declaration.

INTRODUCTION

In 1992 Estonia became a member of the IAEA and joined the Treaty on the Non-Proliferation of Nuclear Weapons, which was the first nuclear-related treaty for the independent Estonia. Safeguards Agreement between the Republic of Estonia and IAEA was signed in 1997 and the Additional Protocol in 2000.

In autumn 2002 SKI and ERPC decided to carry out a mutual co-operation project in order to make a historical review of the nuclear energy and nuclear weapons related activities which took place on the Estonian territory during Soviet occupation, i. e. research, production of fissile materials, holdings of nuclear materials and stationing of missiles and other nuclear related issues. SKI was the project coordinator and the funding was granted by the Swedish International Development Cooperation Agency (SIDA). The Estonian expert group consisting of three experts (a historian familiar with archival research, a technical expert from a research institute, a staff member with administrative and political experience) was established and the time schedule for meetings and seminars was planned. The cooperation project was decided to last for ten months.

PROJECT OVERVIEW

Similar co-operation projects were also initiated in Lithuania and Latvia. All together four meetings were planned in the framework of the project. The project started with a training course to equip the expert groups with the needed basic knowledge in order to carry out the survey. In the next phase the expert groups made a domestic inventory of available sources (archives, individuals and the other information resources) to be used for a national review. In addition to this work a preliminary investigation about the relevant information availability in Russian archives was made. In the second meeting, the information situation and the project in progress was discussed. The third meeting was held to sum up the work and to discuss issues to accomplish the project. In the fourth meeting the content of the final reports were presented. The results of the expert groups work were published as reports in all three Baltic States.

MAIN AREAS OF INTEREST

The historical survey of Estonia was mainly focused on two areas: the uranium mining and milling at Sillamäe, and the activities at the Soviet Naval Nuclear Training Centre at Paldiski. Both facilities were established for realization of the former USSR nuclear programme. After Estonia regained its independence the facilities were taken over under the control and responsibility of the local authorities. The published report represents the best available information the authors were able to obtain during the project. The report consists of three parts: "General background", "Uranium production research at Sillamäe, Estonia, in 1949 – 1989" and "The former Soviet Naval Nuclear Training Centre at Paldiski" [1]. The first part

gives a general overview about the Soviet atomic industry development after World War II in connection with the uranium supplies available. Some archival aspects and classified status of the material are discussed. The status of Estonian town Sillamäe is described. Next part gives an overview about the uranium production from the local Dictyonema shale, imported ores and concentrates. The last part gives an overview about the former Soviet Naval Nuclear Training Center and the decommissioning process activities at Paldiski.

2.0. Uranium production at Sillamäe

Sillamäe is a town on the southern coast of the Gulf of Finland, 172 km east of Tallinn and 25 km from the Russian border. After World War II, Sillamäe became an important military industrial facility for the former Soviet Union. Initially the plant was intended to produce uranium from the local Dictyonema shale. Access to the city was restricted and everything that went on there was a strictly kept secret. Later the plant switched to imports from East Germany, Czechoslovakia etc. In 1982, the processing of rejected fuel elements was started. In December 1989 uranium processing at Sillamäe was stopped. The plant was privatized in 1997 and renamed “AS Silmet”. They are currently producing rare metals, rare earth metals, their compounds and alloys.

2.1. The former Soviet Naval Nuclear Training Centre at Paldiski

The facility locates about 40 km west of Tallinn, on the Pakri peninsula. The peninsula, including town Paldiski and two main harbours, housed a submarine base with a nuclear training centre for submariners of the former Soviet Union. Paldiski was a closed town with restricted access until 1993. The naval training centre with two submarine nuclear reactors located about 4 km outside Paldiski in the middle of Pakri peninsula and was under supervision of the Baltic Fleet of the former Soviet Union. The main aim of the training center was to educate crews in the operation of strategic ballistic missile submarines. The training covered all theoretical and practical aspects in the operation of submarines in peace and war situations. The nuclear site occupied 26 hectares and consisted of the main technological building and seven relevant auxiliary facilities. After the site take-over by Estonia in 1995, the new site operator A.L.A.R.A. AS started to develop the plans for the safe management, clean-up and decommissioning of the site facilities. At present the main objective is to implement a series of well-defined actions that will guarantee the safe storage of the Paldiski sarcophagi for a period of at least 50 years by improvement of sarcophagi safety, designing and building the ventilation systems, dismantling of unnecessary parts of the main technological building and improvement durability of it against weathering.

INFORMATION SOURCES

To write a comprehensive overview about the nuclear activities taken place on the territory of Estonia during 1945 – 1995 was not an easy task. Documents related to Sillamäe and Paldiski facilities were (or some of them still are) strictly classified and a considerable part of the documents are kept outside Estonia.

2.2. Sillamäe

Documents of the Sillamäe uranium extraction factory are stored in the archive of the AS Silmet at Sillamäe. The materials with the then-time stamp “Classified” – *секретно (с)* and “Strictly classified” – *совершенно секретно (сс)* have lost their previous status by now and at present all the historic documents are available to researchers. The materials on uranium production have been collected in one so called “Uranium room”. All the existing materials have been indexed in the card file. Besides the materials concerning the Sillamäe factory, one can find there also studies on different uranium production technologies (including those not applied at Sillamäe). The archive of AS Silmet is a valuable source for research work for the researchers of different fields (general historians and historians of science, chemists, physicists, technologists, etc.), including students. According to AS Silmet specialists, the

archive covers a complete set of the Soviet-time documentation in the forms of copies, while the originals, as a rule, have been sent to the former headquarters in Moscow. It is rumored that the first atomic bomb of the Soviet Union was built of the uranium extracted at Sillamäe. The expert group of the project does not have information to confirm it. According to the specialists from Sillamäe, the uranium extracted at Sillamäe might have played some role in the development of the bomb, nevertheless, they were pretty confident that the quantity of the output of Sillamäe was far less than it was necessary for the first bomb.

The topic of uranium production at Sillamäe is of an absolutely secondary importance in the major context of the development and history of the Soviet atomic bomb. In the Estonian State Archive no documents about Sillamäe are available, which means that the period of almost forty years has not been reflected in any public documents. A great number of new archive documents have been brought onto circulation by professor David Vseviiov. Most of the material presented in his work [2] has been collected from the funds of a special branch of the State Archive of Estonia – Communist Party Archive (Partarhiv) as well as from the archive of the Sillamäe factory. Several articles regarding the history of uranium production at the Sillamäe plant have been published in the Estonian journal Oil Shale.

Research institutions involved in the studies

The decree of 27 July 1946 issued by the USSR Council of Ministers ordered twelve well-known research institutions of the Soviet Union to carry out research on shale in the following areas:

1) Chemical composition:

- All-Union Institute of Mineral Raw Materials (ВИМС)
- V.G.Hlopin Radium Institute of the USSR Academy of Science (РИАН)
- Leningrad Mining Institute (ЛГИ)
- Scientific Research Institute of Processing Mineral Resources (Механобр),

2) Beneficiation:

- Scientific Research Institute No. 9 (НИИ-9)
- State Scientific Research Institute of Nonferrous Metals (Гинцвмет)
- All-Union Institute of Mineral Raw Materials (ВИМС)
- Scientific Research Institute of Processing Mineral Resources (Механобр),

3) Hydrometallurgical extraction of uranium:

- Scientific Research Institute No. 9 (НИИ-9)
- All-Union Scientific Research Institute of Hydrometallurgy (ВНИИГ)
- All-Union Institute of Mineral Raw Materials (ВИМС)
- N.S. Kurnakov Institute of General and Inorganic Chemistry of the USSR Academy of Science (ИОХ АН)
- All-Union Scientific Research Institute of Geology (ВСЕГЕИ),

4) Uses of shale organic matter:

- Institute of Combustible Mineral Resources of the USSR Academy of Science (ИГИ АН)
- Moscow Division of the Mendeleev Chemistry Association
- Institute of Industrial Research of the Estonian Academy of Science.

The results achieved by the institutes differed widely and did not meet the expectations at all as can be seen from the directive "The results of the scientific research on the Dictyonema shale" of 4 June 1948 of the First Main Directorate of the USSR Council of Ministers. The most important objective, extraction of uranium from the shale into the final product was,

instead of the expected 70 – 80% extraction, as follows: All-Union Institute of Mineral Raw Materials – 20%, Scientific Research Institute No. 9 – 44%, All-Union Scientific Research Institute of Hydrometallurgy – 57%. A year later, the second directive of the First Main Directorate was issued on 7 May 1949. It stressed the importance of developing a new technology for efficient uranium extraction from the Estonian Dictyonema shale. The best USSR equipment and new highly qualified staff were to be provided. In the published report different flow sheets of uranium production at Sillamäe are described: chlorate-acid-soda scheme for Dictyonema shale, chlorate-acid-soda scheme for imported ores, sorption leaching scheme, acid-sorption scheme.

In 1949 the preparation works for processing higher grade imported ores were started at Sillamäe. It was justified as a temporarily undertaking until the elaboration of effective technology for Dictyonema shale would be completed. So far the technology was missing and in 1950 – 1951 at Sillamäe the maximum uranium extraction percent from the local Dictyonema shale was only 40%. The Estonian Dictyonema shale turned out to be a rather non-uniform ore with unpredictable properties not being subject to technologies used at that time.

2.3. Paldiski

To write an overview about the Paldiski site we could use only political documents. For the historical survey we have used information from the archive of Estonian Ministry of Foreign Affairs, the papers of PIERG (Paldiski International Expert Reference Group) meetings and the papers of the CBSS (Council of the Baltic Sea States). The original documentation about the site is missing and the technical data are very limited. So the overview about the Paldiski site describes mainly the international assistance and the decommissioning activities which took place in 1990s.

OUTCOMES

In the co-operation projects of the Baltic states a general model for a national based survey based on the Swedish experiences was used [3]. On one hand the model was used as a project guideline, on the other hand the project activities in three Baltic states hopefully helped to develop some features in the guideline, which probably will be used by other states in similar survey projects.

Carrying out historical reviews develops competence in nuclear matters and provides the knowledge on State's past nuclear experience in particular. In respect of this the historical survey fulfilled its objective.

As a result of the project the report "Historical Survey of Nuclear Non-Proliferation in Estonia, 1946-1995" was published in English and Estonian. The report was inputted to the INIS database, the full text of the report is available from INIS in electronic form; also available from the home page of the Estonian Radiation Protection Centre¹.

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REFERENCES

- [1] MAREMÄE, E., TANKLER, H., PUTNIK, H., MAALMANN, I., Historical Survey of Nuclear Non-Proliferation in Estonia, 1946 – 1995. Tallinn (2003).

¹ http://www.envir.ee/kiirgus/image/Nonpro_est.pdf (in English),
http://www.envir.ee/kiirgus/image/Nonpro_Eesti.pdf (in Estonian).

- [2] VSEVIOV, D., Sillamäe – A Secret Uranium Town in Estonia. From 1944 to mid-eighties. The publication was available in Internet <http://www.undp.ee/iviru/silla.html>.
- [3] JONTER, T., Making a Historical Survey of a States' Nuclear Ambitions². SKI Report 2003:18. Stockholm (2003).

²http://www.ski.se/dynamaster/file_archive/030910/42d6875b68e0f6f07594e32c258735b3/SKI%20Report%202003%2d18.pdf.