

NUCLEAR KNOWLEDGE PRESERVATION IN LITHUANIA

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Abstract

In the article problems of Nuclear knowledge management and preservation in Lithuania are presented. Very important for Lithuanian was support provided through bilateral co-operation projects. Main projects implemented in the last fourteen years are described. Lithuania joined INIS (International Nuclear Information System) in 1994 and established its own INIS national centre in the premises of the Ministry of Economy. To educate public about processes going on in Ignalina NPP the information centre of Ignalina NPP was founded. Nuclear and nuclear related education in Lithuania provides Kaunas Technological University.

Key words: knowledge management, international cooperation, information exchange, nuclear education, data bases.

Introduction

As in all fields of high technologies, the safe use of nuclear energy strongly depends on gained knowledge, accumulated expertise. This could be scientific research, reports by regulatory, operational data, maintenance records and other. Nuclear knowledge also includes human factor – various specialists, engineers, scientific workers, experts. Ensuring the proper level of nuclear knowledge and sufficient quantity of required specialists is very important for nuclear power industry.

Information exchange

Lithuania operates only one Nuclear Power Plant – Ignalina NPP with two RBMK – type latest design reactors with a nominal capacity of 1500 MW each. The first unit of the Ignalina NPP was put into operation at the end of 1983, the second unit – in August, 1987. During the last fourteen years with the assistance of foreign countries safety of these reactors was upgraded very much. However RBMK reactors are classified as non-upgradable and should be closed as soon as possible. Our Parliament has set a decision to close the first unit before the year 2005, taking into consideration long-term substantial financial assistance from countries of European Union, G7 group, other countries and international financial institutions. The second unit will be closed in 2009 under same terms and conditions.

Anyway National Energy Strategy provides that taking into account global nuclear energy development trends, the latest technologies of reactors and their technical-economic characteristics, a comprehensive study on the continuity of the use of nuclear energy in Lithuania will be prepared in 2004, covering the justification of nuclear safety and acceptability of nuclear energy, including the construction of new nuclear power plants (reactors). The objective of the study is to evaluate possibilities to continue use of nuclear energy in Lithuania, political, social, economical and environmental preconditions in the context of reliability of electricity supply, safety, electricity prices, macro economical expansion, EU politics and international environmental obligations.

It is important to keep nuclear knowledge despite we don't know what will bring future for nuclear power. How the usage of nuclear power will develop in the future? How to preserve nuclear knowledge if nuclear power plant is closed? These questions are arising now in front of Lithuania. Despite all attempts to exchange and retain the knowledge it is time to notice

and pay more attention to the nuclear knowledge preservation issues at the governmental level in Lithuania.

International co-operation and other initiatives

Ignalina NPP was built by Russian specialists and only after it was returned to the Lithuanian jurisdiction, Lithuanian specialists started learning and accumulating expertise intensively. It is necessary to have knowledge about up-to-date technological improvements, standards approach, and experience of foreign colleagues. At the time of restoration of independence of Lithuania, Ignalina NPP claimed for the transparent policy in operating the nuclear plant and launched the international co-operation in the area of improving the power plant safety. Information exchange is practically useful and very effective form of the knowledge building. Very important input was provided by IAEA through technical co-operation programmes. Support provided through bilateral co-operation projects was indispensable for the Lithuania. The first country that provided Ignalina NPP with consultancy and most significant assistance was Sweden. The co-operation with Sweden commenced in 1992 and has been in progress so far today. Based on the support provided, Ignalina NPP was able to implement the assessment of the plant safety and compare it with the safety rate specified for the western nuclear power plants.

The BARSELINA project (1992-2001) – level 1 and 2 probabilistic safety assessment (PSA) of the Ignalina NPP conducted by Sweden, Lithuania and Russia. At different stages of the project the study was reviewed by USA (1994) and IAEA (2000 and 2001) experts. This project provides a unified basis for the assessment of severe accident risks for RBMK type reactors and the preparation of remedial measures. Some of the improvements highlighted by PSA have already been implemented at the Ignalina NPP.

Another project of the Lithuanian-Swedish bilateral programme is the implementation of modern non-destructive testing (NDT) systems for in-service inspection of the pressure boundary system. An other project is the preparation of an "Overall Plan for Radioactive Waste Management" in Lithuania by Swedish Nuclear Fuel and Waste Management Co., SKB. Project "Fire and flooding protection" helped to improve the whole fire protection system at Ignalina NPP.

Lithuania has or had multilateral and bilateral projects, mostly concerning safety of nuclear power plants, and with other highly developed Western countries: Germany, the USA, the UK, France, Belgium, Italy, Switzerland, Denmark, Canada, Finland and Japan.

The most significant multilateral projects were the TACIS founded International RBMK Safety Review Consortium, Lord Marshall's Users Group for Soviet Designed Reactors and the IAEA extra budgetary programme on RBMK reactors. One of the most important projects for Lithuania was the international project "Safety of Design Solutions and Operation of NPP's with RBMK Reactors" covering a broad range of safety related topics with Unit 2 of the Ignalina NPP used as a reference plant.

SAR (1995-1996) – first Western-style safety analysis for any Soviet-design NPP. Specialists from the Ignalina NPP, Russia (main RBMK designer RDIPE), Canada, UK, USA and Sweden participated in the project. The SAR team supported the Ignalina NPP management convincing that (1) an adequate safety case for continuing operation of plant had been demonstrated; (2) the safety case would be adequate to the point of first gap closure, which will be the lifetime limiting factor; and (3) the plant's safety standards and practices had been assessed and recommendations for improvement had been made and accepted by Ignalina NPP. A significant conclusion stated in the SAR is that none of the analysed safety concerns require the immediate shutdown of the plant.

RSR (1995-1997) – an independent review of the SAR, which was performed by Western (France, Germany, Italy, UK and USA) and Eastern (Lithuania, Russia) experts. The RSR

team agrees with almost all the SAR team's recommendations for improvement and made some additional recommendations. They, however, were not able to agree that a fully adequate safety case had been demonstrated and gave a set of recommendations both on the additional analyses and safety improvement measures to be implemented. These recommendations formed a basis for the Ignalina NPP's Second Safety Improvement Program (SIP-2) approved in 1997.

Level 2 Probabilistic Safety Assessment of the Ignalina NPP (2000-2001) – the study had been conducted by joint Lithuanian-Sweden team and reviewed by UK experts. IAEA IPSART mission appointed to review this study was completed in October 2001.

There have been implemented a number of projects with the USA financed by the Department of Energy and USAID framework of Nuclear Safety Assistance Programme for Lithuania. The Ignalina Source Book was prepared and printed in 1994 in close co-operation with the University of Maryland. Brookhaven National Laboratory (BNL) and Science Application International Corporation (SAIC) from the USA together with Nuclear Installation Safety Laboratory have developed the RELAP5 model for the Ignalina NPP. BNL also assisted with the development of the Ignalina NPP Analyser, and the University of Maryland is conducting an assessment of the Accident Confinement System using the software code CONTAIN. Other project with USA helped to develop western style Configuration Management programme for Ignalina NPP and provided plant staff technical support. One of projects, "Symptom-Based Emergency Operating Instructions (SBEOI) Support", in Nuclear Safety Assistance Programme with US is very useful for bringing safety level of Ignalina NPP to internationally approved standards.

Co-operation in nuclear safety improvement at the Ignalina NPP with Japan specialists started in 1994. In the frame of the Agreement of Co-operation for Safety Improvement at the Ignalina NPP signed in 1996, Science and Technology Agency of Japan started two big projects: "Co-operation on plant operation management" and "Co-operation on fuel channel integrity". In November 1998 Japanese experts installed at Ignalina NPP a data server system as result of the first project. The second project includes problems of inspection equipment for oxidized layer thickness of fuel channel and investigation of corrosion of fuel channel.

GRS (Germany) and Nuclear Installation Safety Laboratory are involved in the co-operative project of Analysis of Safety Aspects of Ignalina NPP, including the studies of neutron dynamics and thermal hydraulics. A compact simulator for operator training of normal and accident scenarios was developed by CORYS (France) and TRACTEBEL (Belgium). Canada mainly provides educational and training courses in the formation of organizations, safety design, waste management, maintenance and inspection of NPP's. The Lithuanian-Swedish co-operative project of seismic evaluation of the Ignalina NPP is finished. A seismic network is placed in and 30 km around the plant. The British authority AEA has launched two Ignalina specific programs: checking the reliability of the Ignalina ultrasonic inspection devices on British mock-ups during the plant operation and a leak before break analysis, including the use of a code treating a transition weld. A Swiss consortium of independent engineers evaluated the design concepts for interim storage of spent fuel elements. Project on radiation monitoring was implemented together with DS&D (USA).

After bilateral co-operation projects were completed, with the view not to lose expertise accumulated during the implementation, workshops or seminars were held, gained information shared and discussed between Lithuanian specialists.

All countries accumulated a lot of valuable information in the sphere of nuclear energy and it is very important to share it. There is a big role of IAEA as a manager of nuclear information over the world. IAEA is providing different channels for promoting nuclear energy, preserving nuclear knowledge and sharing the information or expertise. Wide range of the

databases together with expert systems managed by IAEA is important support for countries. Excellent way to exchange information and ideas, to discuss suggestions are conferences, symposiums technical meetings and other events.

Thereby co-operating and exchanging experience, information with many countries during fourteen years of independence Lithuania accumulated a lot of knowledge, prepared required specialists in nuclear energy sector. It would be unforgivable to lose all that. In connection with approaching decommissioning of Ignalina NPP Lithuania faces few problems: how to keep Ignalina NPP personnel, how to promote nuclear energy between younger generation and how to preserve nuclear knowledge and expertise.

Nuclear data bases

One of the ways to store and preserve knowledge is to make database about all information available. Few research works are completed in the field of nuclear energy every year, so Lithuania issues some valuable scientific journals, international conferences are held. So Lithuania joined INIS (International Nuclear Information System) in 1994 and established its own INIS national centre in the premises of the Ministry of Economy. This membership is the possibility to search, sort and add information available in Lithuania to INIS database and share it with the rest of INIS users all over the world. On the other hand it is a great chance for users in Lithuania to operate information already existing in the database.

Possibility to search INIS is provided by National Library of Lithuania – it has collection of INIS database on CD-rom. Additionally a big collection of IAEA documents, monographs, periodic and other publications regarding nuclear energy is collected and available in the special reading-room in the library for the documents of international organizations. Kaunas Technological University and Lithuanian Energy Institute has access for INIS on internet. This allows students, scientists and research workers to use all available bibliographical information.

Nuclear Education

To educate public about processes going on in Ignalina NPP and popularize nuclear power the information centre of Ignalina NPP was founded in July 1995. Till 2004, January 1st about 50 thousand people from 20 different countries have visited the centre. Information centre presents model of the Unit, model of the fuel assembly, model of the cask CASTOR for the spent fuel, various video films and publishes “The Information bulletin” every month, where you can find an information about the plant operational data, reliability and operation of Ignalina NPP, radiation situation on the plant site, events according to INES, news and events; “The News Sheet”, which contain articles about the most important things and events at the plant and in the nuclear energy; prepares and different booklets, calendars and magazines about Ignalina NPP.

Kaunas Technological University in Lithuania is specialized in providing nuclear and nuclear related education in Bachelor (2 years) and Master of Science (1,5 year) courses. Steps for promoting nuclear energy between younger generation are taken. University organizes seminars, conferences and different meetings together with the postgraduates of the secondary schools, publishes articles in the popular journals.

Agreement between Kaunas Technological University and Ignalina NPP was made regarding additional scholarships and guarantees of employment for nuclear engineering students. Unfortunately all these actions are condemned to failure because of the early shutdown of the Ignalina NPP. Interest in nuclear energy is decreasing between young people in recent years. Herewith the problem of ageing of Ignalina NPP personnel and workforce in nuclear energy sector overall is arising because young people do not want to choose a specialty without the future in Lithuania.

After decision to shut down Ignalina NPP the problem how to keep specialists and to preserve their knowledge for the future generations rises. To solve this problem and to keep people working in nuclear sector knowing the exact shutdown date some measures are taken – special programmes are prepared and confirmed by government to ensure safe operation of the second unit of the Ignalina NPP until it will be shutdown. Seeking to mitigate the negative social consequences and ensure safe and uninterrupted work of the Ignalina NPP when pending the end of operation, the Law on Additional Employment and Social Guarantees for the Employees of the State Enterprise Ignalina Nuclear Power Plant was adopted. The Law establishes additional employment and social guarantees for the employees of the State Enterprise Ignalina NPP who are being or have been dismissed from work as a result of decommissioning of first and second units of the Ignalina NPP as well as for their family members. Regarding to the social guarantees, among other provisions, the insurance of the employees, the granting supplementary severance pay and the granting and payment of pre-retirement unemployment allowance are provided.

Conslusions

IAEA role is very important in the coordinating efforts of maintenance, development and preservation of Nuclear Knowledge.

To maintain Nuclear Knowledge must be made efforts to share information between countries. Management of international co-operation is very important.

Lithuania should pay more attention at the governmental level to Nuclear Knowledge preservation problems and inicieate special programs to preserve accumulated information and expertise for future generations.

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