

## Approaches to technical and scientific support for the nuclear regulatory body in Belarus

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**Abstract.** Approaches to technical and scientific support for the State NPP Program in Belarus are described and compared with the recommendations of the IAEA. The past infrastructure in Belarus did not have specialized technical support organization (TSO) for the nuclear regulatory body. Currently, there are two technical and scientific support centers, nominated by decrees. They are part of the NPP infrastructure and belong to the National Academy of Sciences and the Ministry of Energy. It is a challenge to establish the needed TSO capacities for the nuclear regulatory body (the Ministry for Emergency Situations) inside existing institutions of the Ministry for Emergency Situations (MES). Initially, the new technical support structure could focus on well known topics like emergency preparedness and radiation protection. The scope of work has to be extended to all major aspects of radiation and nuclear safety of the new NPP soon. National education as well as international knowledge transfer are important for that. Tasks and challenges of new technical safety institution(s) are described.

### 1. Introduction

According to a decree of the Council of Ministers in 1993, Gospromatomnadzor (This State body was primary responsible for Supervision of Industrial and Nuclear Safety) has been assigned to act as national competent authority in the field of nuclear and radiation safety and for physical protection of nuclear materials and facilities. A program to license industrial and medical users of radiation equipment, which was neglected during USSR' period, was immediately started. Today, the Ministry for Emergency Situations is the State body that is responsible for control and co-ordination of all issues related to the nuclear and radiation safety and radiological protection (*the nuclear regulatory body*).

The Republic of Belarus strives to take all necessary measures to ensure peaceful and safe use of nuclear energy. The feasibility study and investigations are performed by the National Academy of Sciences to prove the expedience of nuclear power development in Belarus. The nuclear part of the power generating will be up to 25-30 %. Introducing nuclear power in the fuel and energy balance of the country will allow to execute the diversification of the use of fuel and power resources, to enhance the economical effectiveness of the fuel and energy complex and to reduce the release of greenhouse gases.

According to [1], the State NPP Program in Belarus is aimed on a NPP with total electricity power of 2000 MW, the first unit of which shall be in operation until the end of 2016 and the second until 2018. For the purposes of decision making to start the construction of the NPP in Belarus, the Government approved the Plan of Preliminary Works, which should be performed before the commissioning of NPP. The arrangements of this Plan cover a wide range of works, needed for the

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preparation to the NPP commissioning, including selection and evaluation of the site for the NPP. The investigations confirming the availability and acceptability of sites for NPP on the territory of Belarus were conducted, taking into account the questions of safe NPP operation, safety of population and environment.

The NPP design selection process is completed. The NPP design with improved light water reactors of the third generation of Russian VVER-type (AES-2006) with capacity of 1200 MW, designed by Atomenergoproect (St. Petersburg, Russian Federation) and supplied by Atomstroyexport, has been selected. The Company OKB Gidropress will be the main constructor of the NPP.

## **2. Existing TSO framework for the nuclear regulatory body**

Taking into account the results and recommendations of IAEA expert missions in Belarus in 2003 (in the Ministry for Emergency Situations) to estimate the nuclear and radiation regulation sphere, the regulatory authority system and in 2007 (in the Ministry of Energy) to define the adequacy of existing national infrastructure for NPP construction, the national nuclear legislation and the national infrastructure come up step by step to a new progressive level.

There are two State authorities which are responsible for nuclear energy infrastructure – the Ministry of Energy (MoE) as NPP project provider and the Ministry for Emergency Situations (MES) as safety supervisor [2]. Other authorities (nuclear security, radiation protection) are coordinated by MES.

The Decree [3] defined that “Belniptenergoprom” (MoE), as national engineering institution, will coordinate and conclude contracts to provide investments. In particular, it concluded a contract with “Energoproect” (Kiev, Ukraine) to provide design and engineering services, to select the site for the NPP, to prepare comprehensive reports about the development of the investment, bids and NPP design. “Belniptenergoprom” has been determined as generally responsible for coordination of the design and the estimated documentation for construction of the NPP.

The Decree [3] determined also that the public scientific institution "Joint Institute for Power and Nuclear Research – SOSNY" at the National Academy of Sciences of Belarus (NAS) shall perform research assistance for the NPP construction activities. The Government drafted together with NAS the Plan of Preliminary Works and project activities necessary prior to construction activities.

The MES is responsible for the independent supervision of the NPP safety and protection of population. For this purpose a new special department (Gosatomnadzor) was established to supervise nuclear safety and radiological protection, to organize expertize for nuclear safety of installations and activities, to process licence requirements and conditions, physical protection, planning of radiological protection activities in case of nuclear and radiological accidents, to organize research activities on nuclear and radiological safety principles and criteria together with scientific institutions, scientists and specialists (including foreigners), to organize the professional training, retraining, upgrading and probation of staff, to participate in the organization of certification for equipment, technologies for installations, nuclear power plants, sources and storages.

Organization and execution of examination of nuclear facilities require legislative basis, considerable work content and resources. For its fulfillment specialists with adequate expert knowledge and analytical thinking are needed, taking into account the complexity of the involved facilities, scale, and kind of work, involved specialists should receive special training with correspondent topic and approach.

Currently, the same national institutions which support the designer, constructor and operator work as TSO for Gosatomnadzor:

- from the Ministry of Education – "The Belarusian State University", "The International Sakharov Environmental University", "The Belarusian National Technical University", "The Belarusian State University of Informatics and Radioelectronics",
- from NAS – "The Joint Institute for Power and Nuclear Research – SOSNY",
- from MES – "Officer-Engineer Institute", "The Institute of Retraining and Professional Development", "Research Institute for Fire Safety and Emergencies Situations Problem".

Today, the main national TSO for MES is "The Joint Institute for Power and Nuclear Research – SOSNY".

### **3. Trends of development for TSO framework for the nuclear regulatory body**

At present, the Belarusian Regulatory authority Gosatomnadzor and its institutions employ 32 members of staff, including 8-9 experts with more than 5 years of experience. Additional expertise will be provided by Gospromnadzor for system and component inspections in the field of pressure vessels, mechanical, electrical and automation related inspections as well as by Russian Rostekhnadzor and its TSO(s) – FSUE "Bezopasnost" and SEC NRS. The "Research Institute for Fire Safety and Emergencies Situations Problem" is planning to act in future as TSO for technical and expert support of MES.

*There are the following trends in relation to different resources:*

*a) national resources –*

The Resolution of the Government of the Republic of Belarus from August 28, 2009 №1116 "On Approval of "State Program on Scientific support for development of Atomic Energy in the Republic of Belarus for 2009-2010 and for the period to 2020" includes the support of regulatory development, implementation innovations, elaboration and research of new technologies, the involvement of independent experts;

the Resolution of the Government of the Republic of Belarus from September 10, 2008 №1329 "On Approval of State Program on Specialists Training for Nuclear Energy of the Republic of Belarus for the period of 2008-2020" includes the opening of new disciplines in higher educational institutions of the country, training in foreign educational institutions and NPP training centers, at operating nuclear power plants abroad and the creation of a national NPP training center;

*b) resources provided through international cooperation –*

IAEA technical cooperation projects BYE/0/006 "Developing Human Resources and a Training System for the Nuclear Power Programme" (for MoE) and BYE/9/016 "Strengthening the Regulatory Authority" (for MES). In addition, more than 35 regional IAEA technical cooperation projects with participation of Belarus are realized and ongoing;

The INSC Project BY3.01/08 (BE/RA/06) "Nuclear Safety Action Programme 2008 - Instrument for Nuclear Safety Co-operation" between the European Union (EU) and Belarus as well as the following INSC projects (Action Programmes 2009-2013) intend to further consolidate and to widen the scope of the cooperation for practical and procedural improvements in terms of assuring a high level of nuclear safety and radiation protection by strengthening the independent and competent regulatory authority and its technical and scientific expertise.

*Trends, based on new INSC scope –*

One important component of INSC (Instrument for Nuclear Safety Cooperation) is the promotion and development of effective regulatory frameworks. This mainly includes the knowledge transfer and support from EU member states regulatory authorities and their expert organizations to the regulatory bodies of emerging countries and their TSOs.

Experience exchange and support to knowledge enhancement referring to application of requirements and methodologies for review and assessment of a Safety Assessment Report (SAR) are essential for a regulatory body and its TSO especially in case of a new NPP construction.

The capability to perform an independent in-depth safety assessment and own deterministic analyses for postulated transients and accidents using sophisticated computer models is a key integral part of the function of an independent nuclear regulatory body for licensing and oversight of the operation of NPPs.

The main licensing activities in the field of nuclear safety are the organization of the licensing process taking into account international experience, procedural questions of licensing, safety evaluation and the need for an involvement of independent expertise (individual experts or organizations). In addition to licensing regulatory oversight in connection to design, construction, commissioning and operation of nuclear facilities is a key-issue for the nuclear safety.

The high level of qualification of the regulatory authority personnel is one of the necessary conditions of quality and efficient fulfilment of Gosatomnadzor duties. All the tasks on staffing,

personnel training and knowledge transfer require the development of a systematic approach to personnel training to provide continuity in regulatory activities.

Important objectives of EU projects are the knowledge exchange about methodology for regulatory review of deterministic and probabilistic safety analysis (DSA and PSA), the continuation of the know-how transfer from the EU Regulatory Authorities to MES and its TSOs within training activities for consolidating the Belarusian competencies and capabilities in the area of DSA and PSA review.

The European Regulatory Authorities and its TSOs (under BMU/GRS coordination) presented their computer code package used in their countries to perform safety analysis of VVER reactors. Thereby, computer codes which allow the assessment of thermal hydraulics, neutron kinetics, containment and fuel behavior were items of interest.

EU projects are aimed on the training of and support to Gosatomnadzor in using international applied methodologies for assessment and review of PSAR and in considering international accepted requirements. Based on the existing version of the PSAR for Belarusian NPP provided by the operator for obtaining the construction license the Gosatomnadzor staff will be supported by the EU experts within on-the-job trainings. In this context selected chapters of the PSAR will be reviewed and assessed.

The following work will be performed by experts of EU TSOs using EU approaches and practices to exchange experience in:

- development of legislative framework in the field of nuclear safety;
- transfer of accident analysis codes, methods for beyond design accident analyses, methods and codes for the analysis of design basis accidents (e.g. ATHLET, ATHLET-CD, COCOSYS, ATLAS, ASTEC, DYN3D);
- licensing support in the field of nuclear safety for the development of the regulatory body and its functions;
- training of the regulatory authority personnel;
- training of the staff of educational institutions of MES.

#### **4. Conclusion**

International co-operation will support the Belarusian Regulatory Authority Gosatomnadzor in strengthening its capability to perform safety assessment and licensing of the new build NPP. One particular aim is to provide support to Gosatomnadzor in establishing a group of experts for independent transient and accident analyses for Belarus NPP using European best-estimate simulation codes for VVER.

The main issue of the mentioned activities is to establish and strengthen structures of sufficient technical capabilities in Belarus to support the effectiveness and independence of the Regulatory Authority Gosatomnadzor as part of the MES and its TSO.

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