Development of Intra- and Inter- TSO network for NRA in Belarus

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Abstract. There are described elements of Intra- TSO network. It is a challenge to establish the needed NRA TSO capacities for the nuclear regulatory body inside existing national system of institutions (Intra- TSO network). Issues for improvement of Intra- TSO network are presented. The specific regulation for development of NRA TSO was elaborated. New regulation establishes scope, objectives, functions and policy of activities for organization of technical support for regulatory body, develops the current requirements of legislation and regulation of Gosatomnadzor and licensing, and has be implemented for arrangement, coordination and planning of NRA TSO activities and arrangements. There is described the current system of external experts for NRA technical support (safety assessment, expertise, supervision) including foreign possibilities (Inter-TSO network) of bi- and multi-lateral agreements and projects to be independent and addition to Intra- TSO network.

1. Introduction

Before 2007, there was not required the separate *technical support organization* (TSO) for previous *Nuclear Regulatory Authority* (NRA). Since 1990 the Inter-regional inspection on radiation safety began operating, as a part of the State Committee for Supervision of Safety in Industry and Nuclear Power (Gospromatomnadzor), and, further, in sovereign Belarus (before to Promatomnadzor) in order to provide functions of comprehensive safety analysis, regulation preparation, expertise.

At present time, the stream of tasks and requirements in nuclear and radiation safety sphere are increased [1]. The Ministry for Emergency Situations of the Republic of Belarus (MES) is the republican authority for the state management and regulation in the field of nuclear and radiation safety – NRA. The department of MES – Gosatomnadzor has technical responsibilities on nuclear and radiation safety. The main elements of compliance according to IAEA recommendations for regulatory infrastructure [2] are implemented in Belarus.

For "Belarusian NPP" the AES-2006 design was selected that meets all the modern requirements and international safety standards [3]. For the implementation to “Belarusian NPP” project, the accumulated experience and practice are used fully and widely; proven technologies of the Russian Federation are being introduced. While preparing substantiation of investment to construction of "Belarusian NPP", Leningrad NPP-2 was used, as an analogue. When execution of the architectural design Baltic NPP was defined, as an object-analog of "Belarusian NPP". As incorporation of proven technologies for the use in the project and proven by experience or qualified by testing or analysis, there are being used experience of designing and construction of Leningrad NPP-2, experience of designing, construction, commissioning and operating from Tianwan NPP (AES-91) in the Peoples Republic of China.

In order to organize expertise for nuclear safety of installations and activities, to process license requirements and conditions, to advance safety requirements in regulation, there was

decided to involve completely available national scientific sector. These approaches develop and consolidate the applied potential of industry safety support, especially from power engineering, academic and university basic research and abstract science. The activity arrangement of specialists with adequate expert knowledge and analytical thinking generates the new system of support of nuclear and radiation safety sphere in Belarus.
In order to strengthen the national regulatory framework in cooperation with EU specialists in 2011 there was elaborated the document of strategic planning “Strategy, Action Plan and Cooperation Plan for Capacity Building to Enhance Gosatomnadzor of the Ministry for Emergency Situations" (2012). This complex analytical essay contains and verbalizes the managerial, technical and administrative activities, necessities and expectations that correspond to the basic tasks of the Gosatomnadzor, including the detailed measures.
Sustainability of practical issues are defined by professional development of staff of the regulatory body through the study of the European experience in reviewing safety assessment reports for nuclear power plants, analysis of accidents with the use of specialized software.

2. Deployment of Intra- TSO network in Belarus for the nuclear regulation

The national planning of nuclear infrastructure development in Belarus is linked to issues of establishment of complex regulatory and legal framework of nuclear power and radiation safety with effective coordination [3]. The potential of scientific support system for development of nuclear energy, human resource capacity in the field of nuclear energy use should be adequate to current tasks and challenges.
The development of national support infrastructure for regulation – Intra- TSO network is priority and primary approach of TSO development. The current network consists of domestic available institutions and specialists. This is the main gear of safety guaranteeing in Belarus.

Key regulatory accents and requirements last years were predestined by national priorities in safety assessment for NPP licensing. Formally, the licensing authority in sphere of nuclear energy and radiation sources use is MES. This function is practical responsibility of Gosatomnadzor. The licensing process has origin from basic legislation [4] separately to ground laws [5,6]. Operator is granted by the one license in the field of nuclear energy and sources of ionizing radiation with amendments and changes. There is possible to consider stages and detail reviews of different activities in order to issue new additions to license. TSO assists in safety assessment review, expertise of operator' set for license procedure.
NRA needs the collection, processing, analysis, organization and storage of information about failures of elements of systems important to safety, and wrong actions of the staff, as well as its rapid transfer to all interested organizations. There is formed a new unit at Gosatomnadzor for the analysis of operational experience. This regulatory direction extremly needs the expertise from TSO to realize comprehensive analysis and research.

During first years of NPP programm realization there are explored some practice requirements to institution which served to Gosatomnadzor. Actions of such institution must not be sporadic for regulatory support, involvement into participation and for internal arrangements, preparations as well. TSO should being to develop and implement measures of a systemic approach to a comprehensive and effective management system, to perform its duties and functions. The activities of institution must be viewed, as a set of interacting processes, all involved in its persons contribute to the objectives in the field of safety and quality. TSO should have to employ a sufficient number of qualified and competent staff in order to perform adequately its tasks and duties.

Acquired knowledge have compulsory used to organize and improve the implementation of the quality management system of TSO, including personnel training, based on the best practices and international requirements. In order to gain a better understanding about NRA technical support, TSO should be in the regulatory system, ministry, as the best way.

The following institutions are acting, as science network for NRA:
the Republican Research Unitary Enterprise "Institute of Radiology" of MES (“Institute of Radiology”);
the Research Institute of Fire Safety and Emergencies of MES (RIFSE);
the Public Scientific Institution “Joint Institute for Power and Nuclear Research – SOSNY” of the National Academy of Science (PSI "JIPNR-SOSNY");
universities, research institutions of the National Academy of Science and ministries (building and construction sector, welding, geology).
There are several institutions of the Mininstry of Education, which are acting, as educational network – the State Belarusian University, the International Sakharov Environmental University, the State University for Informatics and Radioelectronics, the Belarusian National Technical University.
PSI "JIPNR-SOSNY" performs the scientific and technical support to Gosatomnadzor in the field of nuclear safety and radiation protection. This institution acts also as a scientific support on NPP construction for the Ministry of Energy and the relevant organizations. The INIR mission indicates the need to divide clearly the responsibilities of PSI "JIPNR-SOSNY" in performing activities for NRA and for NPP. It was recommended to create different organizational structures for each type of support.
The main objectives of “Institute of Radiology”: analysis of transfer of technical radionuclides into the environment in normal and accidental situations; prognosis of contamination with biologically active radionuclides; evaluation of possible doses; preparation of proposals and measures for agricultural activities with the aim to reduce radioactive impact of ionizing radiation to the agricultural ecosystems.
The creation in Gosatomnadzor of new structural department for communication and public information initiates the involving to TSO sphere the Branch of "Institute of Radiology" – "Belarusian department of the Russian-Belarusian Information Center on the consequences of the Chernobyl disaster" (BDRBIC). Gosatomnadzor is developing to study of media companies of overseas regulators in the field of nuclear and radiation safety the information and communication strategy.
RIFSE is the basic approved NRA for standardization in the field of fire safety in the Republic of Belarus. The institute is involved in applied research and experimental developments in the area of fire safety provision, prevention and elimination of emergencies. The main objectives of the institute are to develop and improve fire and rescue equipment, fire extinguishing means, technical means of fire protection, safety and rescue equipment, methods and means of safety provision for people and their property.
A necessary national training system has formed in the country for both operator and regulator to support nuclear energy with highly qualified specialists, as well as to maintain an appropriate level of knowledge for the safe, reliable and efficient NPP operation. According to the needs, the state order for work force training is formed as based on requests from key state authorities and institutions. The scope of training, retraining, advanced training of specialists, scientists of high qualification with specialty and workers is defined according to every year.
In order to systematize the existing TSO infrastructure there was elaborated regulation document in 2012 [7]. Forethought that this Technical Codes of Practice (TCP) is the basis, i.e. general requirements, in the series of regulation for organizing of technical support for regulatory body. Document is based on key elements of national legislation and regulation on

nuclear and radiation safety, licensing [4-6] and intend for any NRA TSO regardless of type of support. There are included many verbatim instructions and recommendations from IAEA publications which concern of content for task, functions, duties of regulatory institutions [8-11].

During elaboration of TCP there was known about IAEA action to create guidelines for external expert support of NRA [12]. The comprehensive inverstigation of draft and final issue show that it is not enough to develop national institutions. GSG-4 contains general approaches, grounds of needing in experts and advisory bodies, how to find experts for different kinds of regulatory spheres, formal features of experts, searching and providing of expert' activities, expressions of expert' opinion in the regulatory system. There is about testing and examination of competence, responsibilities to be an expert, assessments of expert' issues to mention in passing. Nevertheless, modern conceptual issues of TSO philosophy and needs are collected and guided by provisions and ideas in order to be a key element of the global safety regime, lessons that may be learned from studying the accident at the Fukushima Daiichi nuclear power plant in Japan, as support for safety comprehensive analysis and inverstigation of safety strengthening steps.

TCP 502-2013 contains requirements to TSO services, description of arrangements, professional prescriptions to whole institution and to every specialist and expert. The scope of TCP is organization, coordination and planning of NRA TSO activities, daily and strategy duties. There is purpose of expert support for NRA and the sphere of competence to realize own responsibilities. The special accent is devoted to resolve of conflict of interests between NRA, TSO and operator in the process of services including safety assessment, as well as the primary role of NRA in decision-making acts. NRA TSO must to have a license to be an expert institution. There are appendixes at the document with details of quality assurance programs and provisions of main procedures, statutes and job description of specialists.

Tasks of NRA TSO are following: realization of scientific lines of regulatory authority; supply of NRA by R&D on nuclear and radiation safety and to optimize programs of international cooperation; accumulation and development of knowledge and tools (methodic, equipment etc.) on nuclear and radiation safety; promotion and development of technologies for nuclear and radiation safety.

The basis for policy and strategy of NRA TSO to prove the safety is supply by necessary professional training of staff in order to support the TSO competency. The origin of competency is provisions and orders of legislation and regulation, which should be implemented by routine study, staff training and research work. There are indicators of competency.

There was made the accent on support of safety culture in TSO such in regulatory authority. The basis of safety culture in NRA TSO is achievement of purpose for safety. There are presented elements of NRA TSO safety culture. The requirement to provide regular selfassessment is established.

Further trends for improvement of Intra- TSO network:

establishing a special MES institution, as inner NRA TSO, e.g. BDRBIC, except of services from the Joint Institute for Power and Nuclear Research of the National Academy Sciences of Belarus, in order to build up existing capacity of regulatory infrastructures;

to implement of requirements from TCP 502-2013 for sustainable development of technical support infrastructure;

to develop special programs and plans correspondent with nuclear and radiation safety regulation, including collaborations with Russia institutions and authorities in order to conduct necessary research and development in nuclear safety, technology and engineering, including that related to existing and new design-specific aspects.

3. Development of Inter- TSO network for the nuclear regulatory body of Belarus

The Inter- TSO network is the secondary, alternative element of support for independent safety review and expert double check. Foreign supports serve to reduce the challenge about national deficiency in experience and knowledge. The main accent of Inter- TSO network is to initiate and undertake measures in order to start arrangements for activities and events of Expert Advisory Council at Gosatomnadzor.

The main direction of external assistance is the country of NPP producer. There was came into force in 2013 Agreement between the Government of the Republic of Belarus and the Government of the Russian Federation on cooperation in the field of nuclear safety. During 2013 there was signed Agreement on cooperation in the field of nuclear and radiation safety supervision in the process of peaceful uses of nuclear energy is under development between the Ministry for Emergency Situations of the Republic of Belarus and the Federal Service for Ecological, Technological and Nuclear Supervision of the Russian Federation (Rostechnadzor). Expert assistance to Gosatomnadzor oversight activities will be provided by Rostechnadzor and its TSO(s), e.g. FSUE VO “Safety”, according to agreements and contracts, especially for systems and components inspections in the field of pressure vessels, mechanical, electrical and automation related.

Belarus is involved into IAEA technical cooperation projects on safety and security topics, management and regulatory measures etc. Cooperation provides the provision of advice on the issues of a training system creation for nuclear energy taking into account international practices and recommendations of the IAEA as well as the Regulatory Cooperation Forum (RCF) advices.

Participation of Belarus in INSC (Instrument for Nuclear Safety Cooperation) is the promotion and development of effective regulatory frameworks. The main scope of current cooperative projects is the knowledge transfer and support from EU member states regulatory authorities and their expert organizations to the regulatory bodies of emerging countries and its TSOs. International EC project "Training and tutoring" enhance the professional level of regulatory authorities’ staff and technical support in the field of regulatory base, safety assessment, supervision, inspections.

Belarusian regulator and NRA TSO are interested in maximum utility of knowledge, experience and skills of experts and leading organizations, partners of the EU within the framework of implementation of technical assistance projects.

Further trends for improvement of Inter- TSO network:
to ensure sufficient competent human resources involved into cooperation to implement receiving knowledge;
to utilize and to share the results of research and development, including conception of Expert Advisory Council at Gosatomnadzor;
to advance the effectiveness of possibilities for bilateral cooperations both organizations and affiliations, e.g. in detailing of elements for safety sphere, discussing of practical knowledge and achieved experience, with RCF, WWER' Regulators Forum etc.

4. Conclusion

The current regulatory system in the Republic of Belarus continually trends to improve nuclear safety. Effected practical steps are correspondent to notes of IAEA Action Plan on Nuclear Safety [13].

The involvement of NRA TSO into highlights of the technical presentations, conclusions and recommendations discussed at the conference is effective resource to strengthen the regulatory framework.
Gosatomnadzor cooperates with the regulatory body of the Russian Federation in the field of supervision over the construction of Belarusian NPP, including the implementation of procedures for quality control of the equipment and construction works.

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