

Development of system regulating and support for nuclear security in Belarus

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Abstract. A safeguards strengthening in Belarus is realized as complex for measures of responsible authorities, advance staff education and international cooperation. The main scope of complex coordinated activities is to provide the sustainable development of national regulatory system and support for current and future challenges in a more globalized world to assure relevant safeguards measures and implements, to get the sustainable international and regional cooperation.

Introduction

The Republic of Belarus ratified the Treaty on the Non-Proliferation of Nuclear Weapons (1993), the Convention on the Physical Protection of Nuclear Materials – CPPNM (1993) and the International Convention for the Suppression of Acts of Nuclear Terrorism (2006). Gospromatomnadzor 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 as well as the State System of Accounting for and Control of nuclear materials and facilities (SSAC), according to a decree of the Council of Ministers in 1993, as primary responsible for supervision of industrial and transport safety. Additional Protocol to Safeguards Agreement was signed in 2005. In the sphere of non-proliferation Belarus cooperates with the Nuclear Supplier Group, the Zangger Committee and the Comprehensive Nuclear Test Ban Treaty Organization.

In February 2011 there was finished the procedure of legalization for membership of the Republic of Belarus in the Zangger Committee. The entrance of Belarus into the group of countries from the Zangger Committee confirm the active and consistent policy line for strengthening of an international regime of nuclear non-proliferation, to be according of national system for export control to high level world standards. From 2000, Belarus is member of the Nuclear Supplier Group.

According to INPRO research, there were identified elements, issues and conformity of legal and regulatory framework in the area of physical protection in Belarus [1].

Belarus realizes national activities by short-term (top-priority and IAEA missions' issues) and medium-term (to 2018 for NPP commissioning) strategic integrated planning in connection to progress of the first NPP construction program, global and regional aspects of safety and security. The main scope is to provide the sustainable development of national regulatory system and support for current and future challenges in a more globalized world to assure relevant safeguards measures and implements, to get the sustainable international and regional cooperation. All stakeholders have rapidly to adapt and identify to new situations or changes in regulations or level of safety. Some key elements of current trends and development of nuclear security in Belarus were identified before [2].

2. Regulatory infrastructure for nuclear security in Belarus

Responsible state authorities

Currently, the Ministry for Emergency Situations (MES) is responsible nuclear and radiation safety and security regulatory authority [3]. MES is responsible for safeguards activities together with the Ministry of Foreign Affairs (MFA). Other authorities (for nuclear security, radiation protection) are coordinated

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by MES. According to legislation, MES is regulatory authority on nuclear and radiation safety – nuclear regulatory authority (NRA). For this purpose, a new special department (Gosatomnadzor) was established to supervise nuclear safety and radiological protection, physical protection, planning of radiological protection activities in case of nuclear and radiological accidents, etc.

There are five regulatory authorities in the field of the use of nuclear energy: the Ministry of Emergency Situations, the Ministry of Natural Resources and Environmental Protection, the Ministry for Public Health, the Ministry of Internal Affairs (MIA) and the State Security Committee (SSC) [3]. MIA establishes the procedure for determining the design basic threat (DBT) in order to be in correspondence to requirements for the physical protection of each facility with nuclear energy using. SSC agrees gaining access to the nuclear facilities [4].

The State Border Committee (SBC) has special responsibilities in nuclear and radiation safety and security on suppression to illegal transboundary illicit trafficking of nuclear and radioactive materials through the State border of Belarus.

According to Presidential Decree No. 602 of 08.12.2009, the State Military-Industrial Committee (SMIC) coordinates the implementing state policy in the sphere of export control aimed at securing import, export and transit and employing objects of export control. The coordinator of these arrangements is MFA. In addition, this branch concerns to cooperation inside of the Customs Union between Belarus, Kazakhstan and Russia (the Common (Single) Economic Space), the Eurasian Economic Community (EurAsEC) of the Republic of Belarus, the Republic of Kazakhstan, the Kyrgyz Republic, the Russian Federation and the Republic of Tajikistan.

Legislation and regulation

General requirements and responsibilities in nuclear security sphere are established by the Law "On the Use of Atomic Energy" [3]. Regulatory authorities have additional responsibilities and functions according to own statutes.

According to the Law "On Export Control" (1998), there are special requirements for export of: goods, technologies and services concerned with nuclear fuel cycle and producing of nuclear materials, which may be used for creating of nuclear weapon or nuclear explosive assembly; weapons of extermination and its delivery systems; goods, technologies and services concerned, which may be used for creating of delivery systems for weapons of extermination; goods and technologies of dual using; goods, technologies and services concerned with international and national safety and security according to international agreements. Lists of export control objects are open, approved by the Government and published. Special conditions for export regime are established by the President. The licensing of import/export for export control objects is realized by SMIC.

The Government of the Republic of Belarus adopted the Act No. 1385 of 27.09.2010 "About approving of the Statute about physical protection of atomic energy using objects". This document was elaborated according to implement requirements of Convention on the Physical Protection of Nuclear Material and IAEA recommendations INFCIRC/225/Rev.4. The Statute defines conditions and administrative means for providing of physical protection for atomic energy using objects according to category of nuclear material and consequences of illegal actions. There were approved key sufficient national regulations especially on physical protection for nuclear and radiation facilities as the Technical Codes of Practice (TCP).

Coordination arrangements

The implementation of strengthening plans and put-up arrangements will lead to integrated regulatory activities in order to allow practical optimization of the resources to get benefits from exchange of experience and issues from safety analysis and oversighting as synergy effect, but not intricate actions. The main accent for new NRA should be done on progressive and positive understanding for value and cost of leadership in management by professional staff and in whole institution such as regulatory authority. All spheres of regulatory life are impacted by not any appropriate leadership culture, but effective and efficient. Leadership is the top of organizational pyramid. Every further organizational culture will correspond to appointed or hand-picked type of leadership in institution, accepted values, beliefs, inter-personal behaviours and attitudes of staff, both senior managers and separate specialists. In complicated and sophisticated regulatory infrastructure, there is necessary to find the balance of corporative-shared interests (competences and its realization) for effective coordination between

different regulatory authorities with different understanding of working culture as whole phenomenon. The development of transparency for national coordination is determined by reason initiatives and proposals to transform of existing or known managerial schemes and accepted professional and cultural standards, which are based on obvious illustrative successful practices and failures both national and international. The corporate and interinstitutional transformation is one of way to get the effective management system.

The main scope of safeguards strengthening in Belarus will reasonably achieved by getting of sustainable synergy between nuclear and radiation security and safeguards regulatory comprehensive approaches of NRA:

to study the evaluation of IAEA safeguards trends, approaches and new issues to provide flexible information support, analysis, acquisitions along with inspections;

to create the Integrated Information System on International obligations of the Republic of Belarus;

to support "human capital" and capacity building of regulatory system by growing next generation of domestic qualified specialists and experts;

to accent on possibilities and preferability of distance regulatory control and procedures;

preparation of general strategic and inspection integrate programm;

to advance the regulatory culture as synergy of managerial, administrative (organizational), knowledge conservation and self assessment implemented and routine measures and actions.

At the present, the national system of education is being forming for provision of nuclear power with highly skilled specialists and for maintenance of the appropriate level of knowledge for safe, secure and effective operation of the NPP. The one of current aims is to build up a cadre of highly qualified and well-trained nuclear security personnel.

Manpower training for safeguards and nuclear security is special direction of education at NRA with piece quality, no mass. The main feature of activities is to recognize needed competency for specialist or expert in addition to routine staff obligation. The trainee should have adequate and recognized working desire.

Seniors specialists should train beginners as duty acts. The intensive training in partnerships is the most effective and efficient. The actual challenge is to be an involved into the routine shuffle of information both manual and automated in order to select, classify, fill forms, define the priority, account features etc.

International obligations of Belarus

Belarus supports the global nuclear non-proliferations regime by IAEA safeguards activities with traditional focus on IAEA activities (regular inspections). In addition, there are trends of national welfare and cooperation arrangements to an expanding workload with the Agency to encourage greater transparency. Gosatomnadzor' specialists use join activities to develop and maintain own skills and knowledge for efficiency safeguards implementations.

Measures on strengthening of regional nuclear security

It takes into account the importance of non-proliferation procedures and control on the State border. Responsible officers should recognize the duty challenges, to identify necessary activities, personal skills to get strong links with border control and customs organizations in order to ensure the national security. There were expanded possibilities and mobile activities to detect radioactive material by hand-held and portal monitors at the State boarder and gateways. That was beneficial for safety and security purposes during preparation to 2014 IIHF World Championship in Belarus.

There is trend on the strengthening of national and regional security based on European security principles taking into account up-to-date experience in use of radiation monitoring laboratories for decision-making as issue of cooperation with IAEA.

The essential contribution in sphere of Safeguards, strengthening of nuclear material control on the State border was done under Agreement between Government of Belarus and Government of Japan about cooperation in non-proliferation of nuclear weapon and establishment of the Committee on cooperation thereupon (1993). The addressee of collaboration was SBC. During 2010-2011 there was realized "Modernization of system on suppression to illegal transboundary illicit trafficking of nuclear and radioactive materials through the State border" by enlargement of existing network of mobile laboratories for operational response.

As activities in continue, there are realized some projects of an international technical assistance for arrangement and strengthening for potential of nuclear physical security of SBC. In November 2013, there was finished TACIS project "Improvement of crossing of Belarus' border" – territory authorities of SBC were equipped by 3 mobile laboratories for operational response.

In 2013 there was approved the cooperation project between SBC and the Second line office of Department of Energy (USA) on suppression to nuclear terrorism and illegal transboundary illicit trafficking of nuclear and radioactive materials. The project scope is creating of Integrated system of detecting, resistance and suppression of crime in illegal illicit trafficking of nuclear and radioactive materials sphere.

Under this project, there was delivery of priority devices to SBC for providing of nuclear security on the State border during 2014 IIHF World Championship in Belarus (8 items of spectrometers, 64 items of portable devices for radiation control and radioactive material search). There is planning to be ready to realize the delivery of pilot mobile systems samples in 2014 in order to supply troops of frontier guard.

The scope of further steps is the development of arrangements, regulation and supervision of physical protection for the first Belarusian NPP including activities on training for front-line officers, information security and cybersecurity of NRA.

3. Approaches of support for nuclear security in Belarus

Complex trends of development

In short-term plan there is beneficial the arrangement of Integrated Information System on International obligations of the Republic of Belarus. It's planning that this system will connect national legislation and regulation pyramid, state authorities' responsibilities, as well as detailed functions and legislative acts with statements of international agreements, conventions etc., including Safeguards Agreement,. It will achieve the development of technical and analytical enhanced findings for national experts, specialists and officers.

On the base of similarity for general organizational approaches in security requirements for nuclear and radiation materials there is possible to join the most part of regulatory activities. There are the same basis on regulation of requirements for physical protection with specifics for nuclear facilities and materials. Especially, it is concerning for preparation of legislation and regulation, supervision and staff training. The synergy of nuclear security tasks may be realized as joint sub-structure of NRA, i.e. the system of complex regulation and methodological support, creation of unified SSAC for all types of radiation sources with sub-part for accounting of nuclear materials. The main issue of such arrangements is optimization of financing maintenance.

The most complex trend is optimization of inspection activities. The step for technical support of supervision is to develop real-time on-line technologies for off-site inspections with different optical possibilities. The one of TSO' task is to simulate models of facilities with visual and radiation detectors to investigate efficiency and to train staff to use it. Practically, the duration of inspections is limited and the programm is planned before. Sometimes the inspection agenda needs deviations to preliminary programm in advance. Models help to optimize inspections to be more selective or focused.

Strengthening of NRA TSO support

The effective and comprehensive fulfilment of responsibilities and assignment of MES needs a deep knowledge and a wide range of experience of all technical and organizational aspects of nuclear security for design, construction, commission, operation and decommissioning of a NPP. Therefore, the regulatory authority has the responsibility either to build up own technical capabilities for detailed review and assessment of processes and activities of the NPP operator or to make sure that a technical support organization equipped with sufficient knowledge and structural capabilities to be involved into assessment and analysis of processes at all phases of the NPP use. The basis of legal decisions is taking into account previous and world knowledge, lessons and experience.

At the same time, there are the needs to provide by specific technical support, which is required for effective use and maintenance of instruments and other nuclear security technical systems, as well as to realize the sharing of scientific support for the main regulator and border guards, customs officials, law enforcement organizations.

Expanding tasks for NRA TSO:

to recognize and determine the integrated functions for safeguards and nuclear securities to demonstrate the strengthening, transparency and commitment about implementation and sustainable understanding of IAEA recommendations;

to develop educational and training programs or courses of optional syllabuses for graduate or postgraduate-high level students about nuclear acts of national (legislation, regulation) and international (agreements, conventions) spheres as "Nuclear Law School" and nuclear and radiation safety and security as "Advanced Course on Nuclear Law" in partnerships with staff of universities to design comprehensive curriculum;

to build the analytical and technical base for both safety and security expertize;

to investigate up-to-date and state-of-the-art analytical technologies and approaches (know-how, fool proof etc.);

to use perspective, advance technologies for forensics measurements;

to participate in calibration and verification activities and procedures, uncertainty estimations;

to test and verify regulation requirements in order to optimize the capacity and arrangements of regulator and operator to get the safety and security maximum;

to investigate safety/security indicators and issues, to identify strengthening of safety and security;

to define and investigate tracers of adequate levels of safety and security, critical factors of efficiency and stability;

to investigate needs in regulation for complementarities between nuclear safety, security, safeguards for the state system of accounting and control of nuclear materials;

to explore evaluation of potential applied applications (technologies, techniques, methods, human factors and training requirements) for approach and conducting of integrated regulatory inspections.

Conception of the Joint center for nuclear security competence (JCNSC)

The Joint center for nuclear security competence may be combined or included into technical support organization of NRA – NRA TSO. Such institutions serve to link interests of national fundamental sciences form institutions with the state requirements of regulation and the real industry in order to optimize existing financing and make mobilization of resources in spheres of nuclear and radiation safety and security. The needs of effective knowledge conservation and transfer to the next generation of specialists are actually for 3S branches concerning to issues from Fukushima lessons on the background of "the battle for competence" (the higher the better).

The important scope of JCNSC is to elaborate the adequate training strategy to be based on challenges of recruiting. The current lack of professionals and flotation of present experts, including the retirement of experienced inspectors and senior staff, are obvious preconditions for insufficient capacity of safety and security. JCNSC will elaborate and investigate a relevant training and education, training facilities, information support of trends for a motivation career management. There are provided the further actions to make clearer definition of competency profiles for NRA positions in nuclear security and safeguards.

The national center may be recognized as an element of comprehensive world capacity building to be valuable at the national, regional or international levels for effective guaranteeing sustainability of national nuclear security regimes, for transfer of nuclear security knowledge and exchanging best practices to be implemented into international nuclear security networks.

Main tasks and functions of the Joint center for nuclear security competence for regulation purposes:

to concentrate nuclear knowledge, experience and know-how technologies;

to realize human recourses, professional culture and infrastructure development programs;

to develop preventive measures and programs to eliminate, decrease the treat of illegal (undeclared, stolen) nuclear/radioactive materials for goods control and mass events;

to support other national services (police, emergency, forensics), export control.

Strengthening of prevention measures

Strengthening the analytical and instrumentation support infrastructure and potential for nuclear forensics requests [5] and trend for forward-looking arrangements. To develop measurement possibilities together with measures for radiation protection, on-site (mobile) laboratory can serve for prevention and preliminary actions, off-site NRA analysis to get independent results (before responsible

expert laboratory at the National Academy of Sciences of Belarus). Mobile lab works for feasible rapid results of environmental sample analysis. In long-term planning there are to get adequate sensitivity, selectivity and reliability of the applied instrument and analytical methods by NRA TSO. The using of measurements combination there is the increasing for efficiency of preliminary on-site decision-making activities, expanding of support toolkit. Measuring equipment provides to involve a new generation of designed and developed monitoring devices and systems from national producers of instruments and techniques, such as the Scientific and Production Enterprise ATOMTEX and Polimaster Ltd.. It is advantageous to get more reliable and sensitively issues for inspections, prevention, search and monitoring purposes and applications including safeguards to assure the independent measure to addition to IAEA activities. New equipment as well as its prototypes will be investigated to be used for combating illicit trafficking and inadvertent movements of radioactive and nuclear materials, its detection, localization and identification, for radiation safety maintenance in places with a high concentration of people and urban areas, for radiation control and monitoring in various radiation and nuclear incidents. It can be benefit interactive design and friendly interfaced tools for distance, off-site (remote) inspections, and so data based oriented measurement devices with spectrometric channels for screening in on-site purposes for non-destructive analysis (NDA) as indicators as well.

The conception of remote inspections and method of checklists are developed to use and optimize the arrangements of regulatory authority in combining with cooperational activities with IAEA. The using of data-transfer technologies proved fully to be guided by information-driven tools and technologies to eliminate human factors. It is especially important in routine procedures with taking into account numerical and quantitative data. Used approaches, available possibilities with equipments and methods determine the type of inspections (notice, short-notice, random) in compose with regulatory plans. In order to realize the conception of remote inspections the operator's facilities should be specially equipped. This conception may be possible to compose with crisis information analytical system of emergency preparedness and response framework. Headquarters (regulatory bodies, operator), key elements of net for pickup data (reports, declarations, photo, video, detectors, locations etc.) must supplied by tools to transmit corresponding data signals. As issue of involved of innovations, there is possible to keep the trend about decreasing the number of on-site inspections to number of off-site or remote oversighting.

The substantial step in strengthening of nuclear security knowledge is to incorporate corresponding topics and paragraphs into educational syllabuses for students, which are studying for newly employed personal of nuclear industry and regulatory authority as well. Such educational elements should use for whole institutions despite on final specialization of students i.e. nuclear, radiation, industry, fire safety, radiation protection, IT-technologies. The main task and target is to cover involved appropriate students and to make an accent about importance of security, to form primary safety and security culture during education process as priority.

The most complex phenomenon of strengthening is creation an adequate and efficient organizational culture in NRA. This complex is combined of system approach in recruiting and staffing, strong leadership for institution management and its units with obvious, ordinary responsibilities and working authorities of heads to be shown, the creation of adequate working atmosphere with positive and progress motivation, the development atmosphere of understanding for team tasks, transparent analysis of mistakes and failures. The security culture will be consolidated as part of organizational culture, which has to be in "operational status" to prevent its degradation, worsen for both separate persons in team and issued to bad working atmosphere.

International cooperation for regional stability

Joint activities under IAEA coordination, e.g. technical projects, international events, regular Safeguards inspections, are continued. There is progress on development of regulatory body as the main key element to enhance efficiency of issues for tasks of safeguards system as well. Integrated Nuclear Security Support Plan is useful tool to identify domestic nuclear security needs in order to be linked with regional aspects by coordination of the Agency and potential donors.

Radioactive sources are widely used in many industrial, research settings, and are commonly available in nuclear facilities. There is a concern that terrorist groups can gain access to radioactive sources and may plan attacks. The United States Department of Energy's National Nuclear Security Administration

(NNSA) Office of Global Threat Reduction is involved in an initiative to reduce the threat of a Radiological Dispersion Device (RDD) incident. Control and accountability of these sources is done mainly from a safety and health perspective, not from the security perspective that is common practice in the control and accountability of special nuclear material. Identifying, consolidating and securing radioactive sources are in the best interests of both Belarus and the United States. Service provider is the U.S. Department of Energy (DOE). Gosatomnadzor provide coordination and implementation support of radioactive source security-related sustainability activities and such projects in Belarus.

Within the framework of cooperation between the European Union (EU) and Belarus, there is realization of some projects on the Instrument for Nuclear Safety Cooperation (INSC) and there is planning the project on the Instrument for Stability (IFS). The scope of INSC cooperation is practical and procedural improvements and implementations 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 supports.

The synergy of activities in nuclear security sphere between projects of INSC and IFS will be achieved by the delivery a mobile laboratory for radiation safety monitoring to Belarus through the project of IFS. Such laboratory will be associated with detection instrumentation, maintains and sampling devices as well as real-time expert support (reach-back), dedicated exercise with all relevant organizations, seminars, training, workshops for sharing information and gaining required experience. The part of INSC project will linked with help to MES/Gosatomnadzor and/or its TSO to prevent emergencies by radioactive sources beyond the regulatory control. Cooperation in this component is directed towards the use of this radiation monitoring laboratories for decision-making support in the area of nuclear and radiation safety assurance based on European safety principles taking into account up-to-date experience. This activity will realized with participation of specialists from Finland and the Ukraine in the delivery of mobile laboratory, consultations and trainings for the familiarization with capabilities of radiation monitoring mobile laboratories and their operation experience in order to support the regulatory authority in Belarus.

The project will consist in the effective transfer of EU experience related to the identification of orphan radiation sources and the detection of hot spots in (and around areas of) facilities used for large public gatherings. It will include the development of survey programme and procedures for activities and measurements related to public gatherings. Practical presentation/refreshment training on use of RanidSONNI mobile laboratory and its equipment for such tasks is part of this workshop. Limitations of the mobile laboratory and ways how to overcome them are to be presented.

4. Conclusion

Development of system regulating and support for nuclear security in Belarus is realized as complex measures of regulatory and legal authorities building, international cooperation activities with safeguards philosophy as core and bearing. The strengthening of domestic nuclear security results to regional level enhancement. The main domestic effects are additional attention, exercise of vigilance and a backup to nuclear material accountancy through arrangement and monitoring access to nuclear material, detecting any illicit trafficking and increasing of safety and security culture, as progressive and efficient trend.

General activities of NRA, as well as coordination measures in Belarus, concern about creation and supporting of healthy organizational culture both institutional and inter-institutional to get efficient, active and system cooperation. The importance attempt is to collect of the knowledge set for beginning regulatory staff at NRA. The forming a well-trained cadre of experts is a combination of professional properties with strategic thinking, ability of multistage work and task planning, risk assessment of senior staff decision-making and taking into account consequences of real and probable issues. Development of nuclear security culture identifies new wide involved areas of cybersecurity and nuclear forensics to enhance ability of NRA to prevent and respond to a range of nuclear security events.

There are undertaking of steps for development of national inspections in order to perform independent measurements including the verification of nuclear material presented by using NDA techniques, usual comparing with the declared figures and the operator's records. In conditions with limited qualified

specialists, remote monitoring and inspections have become important elements to maintain and increase effectiveness of 3S activities with less financial resources.

The one significant task for the centre of competence is to carry out modern R&D projects to catch appeared novel trends in non-proliferation topics. In cooperation with expert world community, there is necessary to display emerging and future needs for 3S complex in order to use actual applied solutions through the exploration of up-to-date, innovative and state-of-the-art technologies also. The considerations should involve into account increasing numbers and types of nuclear facilities with an increasing potential risk of the proliferation of sensitive technologies.

Regulatory achievements will be compared to IAEA trends with realizing of strategy on moderateness for reasonable transparency to sensitive information. The main accent is arrangement of activities and interactions between experts, but not to all stakeholders. The issue should be a selectivity and vigilance. The most importance should pay to transparency for procedures to get data. The IAEA INSServ mission will be planed to take place in the nearest time. Contacts between experts including IAEA staff might be used to mark, crystallize the best national and regional practices as well as self assessments for both system and interactions to be as catalyst for actual domestic or international analysis.

Collected and implemented information and knowledge, analytical thinking of involved specialists underlie in the conception of the Joint center for nuclear security competence in Belarus as issue of cooperation activities with IAEA, EU and other communities, which are interested in prevention of global treat, e.g. USA, to optimize would technical support and experience exchange. This trend is in the spirit, declarations and measures of IAEA plans [6,7] and the 2012 Seoul Nuclear Security Summit to enhance nuclear security culture, support human resource development and education and training in nuclear security and maintain experts. The support of sustainable nuclear security regimes by using recourses of national nuclear security support centres [8] may be realized by potential of Integrated Nuclear Security Support Plans in order to improve regional security and cooperation. The promotion of self-assessment and the provision of peer reviews provide comprehensive consideration of achieved levels of nuclear safety and nuclear security to get either directly or indirectly and synergy in regulatory and supply activities to avoid adverse organizational affects. This approach will issue to coordinated education and training programme in nuclear security according to identified requirements and needs based upon the relevant international instruments and internationally accepted standards.

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