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Legal Regulation of Ensuring Nuclear Safety and Security in Ukraine on the Way to European Integration

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Abstract
The article is devoted to the analysis of legal regulation of the sphere of nuclear safety and security of Ukraine on the way to European integration. The authors drew attention to the importance of Ukraine achieving the necessary level of and nuclear sefaty and security adopted in the EU member states. The emphasis was placed on the fact that the prospects for fulfilling national obligations in the field of nuclear safety in accordance with European standards directly depend on solving the problems of ensuring the functioning of nuclear facilities, the physical protection of nuclear materials and installations as well as radioactive waste management. The main directions of ensuring the nuclear safety and secutiry in the world within the international law are considered. The role and activities of the International Atomic Energy Agency (IAEA) in setting up a regulatory framework for nuclear safety and security are analyzed. The international legal framework for nuclear safety and security was discused.The legislative basis for nuclear safety and secutiry in the EU IS characterized. The issue of legal norms unification in the field of nuclear safety regulation of EU member states was considered. The principles of legal regulation of nuclear a safety and security in Ukraine are characterized.

Key words: nuclear safety, nuclear security, public administration of nuclear safety and security, legal regulation of nuclear safety and security, European integration, sustainable development in the field of ensuring nuclear safety and security.
UDC 35:574:339.9:349.6 *JEL Classification: K 23, K 32, K 33, Q 5*

1. The general statement of the problem.

An important task in the state management of nuclear safety and security of Ukraine on the way to European integration is bringing national commitments to the standards of the international legal sphere in this area. The solution of this problem is possible in the context of a natural social process of development that is inextricably linked with the impacts (internal and external) in various spheres of public life both within our country

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and in the EU member states, candidate countries for EU membership, and also EU-opponents.
The European Union has clearly defined the eligibility criteria for accession by the applicant countries. This also applies to nuclear safety and security. The main of these criteria are the achievement of the necessary nuclear safety and security level in member states and the nomination of higher requirements to candidate countries in the field of nuclear safety than to EU member states.
Meeting of these commitments in a globalized environment is an extremely difficult task, as it is hampered by various factors. That is why today it is the case that different levels of requirements are put forward to each country - from the implementation of the general recommendations regarding nuclear safety and security to NPPs decommissioning. However, only the desire of each state to approach the implementation of nuclear safety and security standards will be an important contribution to both national and European security.
The prospects for fulfilling national obligations in the field of nuclear safety and security in accordance with European standards are directly dependent on solving the issues of radioactive waste management and ensuring the physical protection of nuclear materials and installations. Accordingly, it will turn away the danger that poses a potential threat to humanity, nuclear terrorism and the production of so-called "dirty" bombs in cae of availability of any radioactive material.

Analysis of recent research and publications.
Research of the problems set for the authors required an analysis of international and national legislation in the field of regulating the nuclear safety and security of Ukraine on the way to European integration in a globalizing environment. The article analyzes the international and domestic legislative documents, which establish and regulate the implementation of the main obligations in the field of nuclear safety and security.
The issues of state policy in the field of nuclear safety and security of Ukraine in the conditions of globalization are analysed in publications of both domestic and foreign scientists. In the context of the this subject the most important are the research carried out by T. Bibik, A. Doroshkevich, M. Zemliany, V. Kravtsov, I. Kuzmyak, D. Pavlov, O. Paseka, O. Pecherytsia, A. Shevtsov, M. Steinberg, in which by the issues identified in the topic of the current article are clarified.

Unresolved issues that are part of a common problem.
It will not be an exaggeration that the international community's interest in addressing the problems of terrorist threats and minimizing their potential consequences, and in particular in the field of nuclear safety and security, is now emerging.

Obviously, it is necessary to require a special vigilance in the control of this area, which stems from the demonstration of modern challenges in the civilized world associated with globalization processes. The solution of the tasks must also be ensured also taking into account the wide range of threats associated with man-made processes, as well as the military conflicts that take place in the world, which creates new circumstances of the complexity of control over the regulation of nuclear safety and security. This is also the

case for Ukraine, because the external aggressive policy of the Russian Federation is an actual problem, which resulted in the loss of the territory of the Crimean peninsula (through annexation) and the war in the Eastern Ukraine. In addition, an unprecedented terrorist seizure of a nuclear installation - an active research nuclear reactor in Sevastopol - was unprecedented in the history of mankind. That is why it is understandable why Ukrainian society is concerned about solving complex tasks of public administration in order to ensure sustainable development, including the field of national security and ecology, and in particular the sphere of nuclear safety and security.

Therefore, the chosen way of Ukraine's orientation towards European integration requires a comprehensive scientific substantiation of solving this problem, and the creation of the newest approaches to the formation of theoretical and practical principles of regulation of this sphere, taking into account the values of the international concept of sustainable development in the conditions of globalization. Here it is necessary to carry out systematic analysis of the mentioned problem and to take into account legal innovations in this sphere.

Due to the urgency of these problems, it is necessary to state a certain lack of complex scientific and legislative developments regarding the solution of the mentioned tasks. Accordingly, it is necessary, under the conditions of modern development, to strengthen the state scientific and applied research in this direction in order to further implement them in practice, thereby achieving the international concept of sustainable development and bring Ukraine closer to achieving the strategic goal of state policy - European integration.

The goal of the article is to analyze the scope of legal regulation of nuclear safety and security in Ukraine in the context of European integration.

The main material.

At the level of state policy of each individual state and policies of international cooperation, it is necessary to create effective legal mechanisms for regulation of nuclear safety and security. This is possible by setting their standards to those that are defined by nuclear legislation in general. In Ukrainian legislation, this is referred to in Article 3 of the Law of Ukraine "On the Use of Nuclear Energy and Radiation Safety" (08.02.1995): "The main objectives of the nuclear legislation are: legal regulation of social relations in the course of all types of activities in the field of using nuclear energy; creation of legal principles of the management system in the field of using nuclear energy and the system of safety regulation during the use of nuclear energy; establishment of rights, duties and responsibilities of state authorities, enterprises, institutions and organizations, officials and personnel, as well as citizens in relation to their activities related to the use of nuclear energy; definition of the basic principles of radiation protection of people and the environment; provision of participation of citizens and their associations in the formation of state policy in the field of nuclear energy use; promoting further strengthening of the international regime for the safe use of nuclear energy "[13]

Today the nuclear energy, including nuclear security, is an important and integral part of the national security of Ukraine. The main tasks in this area include the regulation of social relations in the conduct of any type of activity in the field of nuclear energy use;

development of legal principles of administrative and legal regulation system in the studied sphere; establishment of rights, responsibilities and principles of legal responsibility of state authorities and local self-government bodies, institutions, enterprises and organizations, officials and officials, as well as citizens of Ukraine, foreigners and stateless persons in relation to their activities related to the use of nuclear energy; ensuring the participation of citizens and their associations in shaping state policy in this area; separation of the basic principles of radiation protection of people and the environment; further development of international cooperation and ensuring compliance with Ukraine's commitments on the safe use of nuclear energy.

2. Directions of ensuring nuclear safety in the world in the international law.

The ensurance of the nuclear safety of mankind was initiated by the legal mechanisms defined by the international normative legal acts regulating the sphere of nuclear safety at the international level:
- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (of 05.08.1963) [8],
- Treaty on the Non-Proliferation of Nuclear Weapons, (of 01.07.1968) [11],
- Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and the Subsoil Thereof (of 11.02.1971) [9] as well as a number of other treaties.

Today, the implementation of international policy in the field of ensuring nuclear safety of mankind is carried out in two directions: the first direction provides for the prohibition of nuclear weapons testing by all states in the whole environment, in particular in land, air and water spaces; the second is regulation of the sphere of use of nuclear energy.

The implementation of the first direction of international policy in the field of ensuring nuclear safety of humanity was initiated in the late 50's of the twentieth century in the diplomatic struggle around disarmament. A reference point for this can be deduced from the Plan for general and complete disarmament proposed he USSR in September 1959 for the consideration of the XIV session of the General Assembly of the United Nations. This plan provided the dissolution of all the armed forces for three years and the destruction of all types of weapons.

The first achievement in the legal field regarding the opposition to the arms race was the signing the Antarctic Treaty on December 1, 1959, which banned the implementation of any military actions on Antarctica, and proclaimed the use of the continent only for peaceful purposes in favor of all mankind. On August 5, 1963 the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (already known as the Treaty on the Banning of Nuclear Testing in Three Territories and ratified by the Ukrainian SSR on October 10, 1963) was signed. This Treaty was the first international agreement on the limitation of nuclear weapons.

The solution of the problem of nuclear weapons non-proliferation became particularly acute in the late 60's. As a result, the UN General Assembly approved the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) on June 12, 196 for its signing on July 1,

1968 in Moscow, Washington and London. It came into force on March 5, 1970 (for Ukraine – on December 5, 1994) [11]

An important document aimed at overcoming the new potential ways of the arms race was the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (May 18, 1977, entered into force on October 5, 1978). The Convention prohibits the use of such means of inmpact on the natural environment, which results in extensive, long-term or serious destruction, damage to, or damage to, any other State Party.

To date, it remains open to reach the full compliance with the mentioned Treaties by all countries and to discuss the possibility of complete nuclear demilitarization of all vital biospheres.

The second area of legal regulation of the nuclear safety sphere concerns the use of nuclear energy for peaceful purposes (the extraction of radioactive raw materials and their use in nuclear energy).

It is necessary to consider that nuclear energy is a complex and multi-stage production process. It includes extraction of uranium ore, uranium enrichment and nuclear fuel production, power generation at nuclear power plants, spent fuel reprocessing and radioactive waste disposal and storage. The complexity of ensuring the interconnection of the parts of the production chain of nuclear energy and the control over it is that they can be implemented in different countries. So, the main supplier of enriched uranium in the western world is the United States. Regarding the import of enriched uranium - France imports up to 50% of its uranium from Africa, and Germany imports it from Canada.

The doffocult issue in ensuring nuclear safety is to the problem of spent nuclear fuel processing. Given the special technological complexity of this process and its close relationships with the military aspects of nuclear energy use, only a limited number of states have appropriate capabilities in this area.

Therefore, the question regarding the international legal regulation of this issue arose. So, back in 1977, France concluded agreements: a) with Japan on the processing of 1600 tons of spent nuclear fuel, b) with the Federal Republic of Germany on the processing of 1750 tons of this fuel.

Hence, taking into account the seriousness of the risk associated with the implementation of nuclear activities, the states have developed and adopted a number of international agreements relating to nuclear damage and compensation. These agreements cover losses caused by the transportation of radioactive materials. These include:

- Convention on Third Party Liability in the Field of Nuclear Energy (of 29.07.1960) [15];
- Vienna Convention on Civil Liability for Nuclear Damage (of 21.05.1963), [7],
- Convention Relating to Civil Liability in the Field Maritime Carriage of Nuclear Material (of 17.12.1971) [22].

The International Atomic Energy Agency (IAEA) plays a leading role in the development of rules and regulations for the transport of radioactive materials as the world's leading international governmental forum for scientific and technological cooperation in the peaceful uses of nuclear technology and energy.

3. Activities of the International Atomic Energy Agency (IAEA)

The IAEA is an international intergovernmental organization of scientific and technical direction, which was established in 1957 in accordance with the decision of the General Assembly of the United Nations. As of April 2015, the Agency consisted of 164 member countries.

Ukraine has been a member of the International Atomic Energy Agency (IAEA) since 1957 (at that time the Ukrainian SSR). This allows Ukraine to engage with the international community to implement all the necessary world practices in nuclear and radiation safety in order to implement them in public policy.

The IAEA is part of the overall system of international organizations of the United Nations, and its relations with the UN are based on a separate agreement of 1959. In accordance with the Statute of the International Atomic Energy Agency, approved on October 23, 1956 (dated October 26, 1956) [34], the Agency's activities are aimed at achieving "the use of atomic energy to maintain peace, health and well-being all over the world" and provide assistance, as well as overseeing and controlling the non-use of nuclear energy for any military purpose. [34]

In this regard, the IAEA serves as an international inspection authority for verifying nuclear materials, equipment and technology in non-nuclear-weapon states with permitted peaceful activities for military purposes (the IAEA safeguards system). The IAEA also sets standards for nuclear safety and security, provides technical assistance to member countries, and encourages the exchange of scientific and technical information in the field of nuclear energy. The Agency provides advisory assistance, facilitates the transfer of skills and knowledge to countries for the effective implementation of national programs for the peaceful use of nuclear energy.

The IAEA presents annual reports to the General Assembly of the United Nations and, if necessary, to the UN Security Council on non-compliance by States with their obligations under the IAEA safeguards system, as well as on other issues of international peace and security.

The most important activity of the IAEA is ensuring the non-proliferation of nuclear weapons. In 1968, 102 countries signed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) [11].

According to the Treaty, the IAEA is responsible for verifying the fulfillment of obligations of its participants. The Agency's control functions - the so-called IAEA safeguards, namely the prevention of the switching of nuclear materials from peaceful applications to nuclear weapons in non-nuclear-weapon countries.

Today the following main directions of IAEA activity have been determined (Table 1):

Table 1. Main activities of the IAEA (composed on the basis of [34])

Main directions	**Brief description**
Nuclear Power, Fuel Cycle and Nuclear Science	Innovative activities in the field of nuclear energy, nuclear fuel cycle technology and materials, capacity building and nuclear knowlede storage for sustainable energy development, promotion of various branches of nuclear science

Nuclear applications in various spheres	Food security and agriculture, health care (cancer treatment, tomography), water supply; assessment and rational use of the marine and terrestrial environment, production of medical radioisotopes and radiation technologies, and the management of technical cooperation for further development.
Nuclear safety and security	Safety of nuclear installations, radiation safety and transport secutiry, radioactive waste management, nuclear security, preparedness for response in case of incidents and emergencies
Nuclear test	Application of the IAEA safeguards system, implementation of agency guarantees in Iran, Syria and DPRK

Under the auspices of the Agency during its operation, a number of international regulatory documents in the areas of nuclear safety, nuclear security and nuclear liability were developed and approved.
The most important of them are:

- Convention on the Physical Protection of Nuclear Material and Nuclear Installations (of 26.10.1979) [21],
- Amendment to the Convention on the Physical Protection of Nuclear Material (of 08.07.2005) [30],
- Convention on the Liability of Operators of Nuclear Ships (of 25 May 1962) [27],
- Convention on the Early Notification of a Nuclear Accident (of 26.09.1986) [19],
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (as of 26.09.1986) [17],
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (of 22.03.1989) [6],
- Convention on Environmental Impact Assessment in a Transboundary Context (of 25.02.1991) [20],
- Resolution 47/68 of the General Assembly of the United Nations " Principles Relevant to the Use of Nuclear Power Sources in Outer Space " (No. 47/68 of 15.12.1992) [33],
- The Convention on Nuclear Safety (17.06.1994) [23],
- Vienna Convention on Civil Liability for Nuclear Damage (of 21.05.1963) [7],
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (of 05.09.1997) [28],
- Convention on Supplementary Compensation for Nuclear Damage (of 12.09.1997) [16],
- Convention on Assistance in the Case of a Nuclear or Radiological Emergency (of 26.09.1986) [17],
- Convention on the Early Notification of a Nuclear Accident (of 26.09.1986) [19],

- Code of Conduct on the Safety and Security of Radioactive Sources (of 08.09.2003) [14],
- International Convention for the Suppression of Acts of Nuclear Terrorism (14.09.2005) [26],

and others.

4. International legal basis for nuclear security

Over the past decades, the creation and upgrading of a new, current direction of nuclear safety, caused by the emerging a significant number of terrorist threats for the nuclear energy industry - physical nuclear security has been continued. It is believed that nuclear security is a set of measures aimed at prevention of, detection of, and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities.

The legal regulation of the sphere of nuclear security is an important component of the legal regulation of the nuclear safety sphere. The international legal framework for nuclear security covers both binding and normative legal documents adopted under the auspices of the UN, the IAEA and other international organizations.

The international legal basis for nuclear security is the following legal and contractual documents:

4.1 The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) [11].

The document is a multilateral international act that was developed by the United Nations Disarmament Committee and signed in 1968. Its purpose was: to prevent the proliferation of nuclear-weapon states, to provide the necessary international control over the fulfillment by the states of obligations under the Treaty on restrictive measures the possibility of an armed conflict with the use of such weapons; to create opportunities for the peaceful use of atomic energy. The Treaty entered into force on March 5, 1970, after depositing its instruments of ratification with the depository states - the USSR (signed in 1968), the United States (1968), the United Kingdom (1968), as well as 40 other countries. France and China signed the Treaty in 1992. Nowadays, almost all the independent states of the world (189 countries) are parties of the Treaty. Non-parties of the Treaty are Israel, India, Pakistan and North Korea. The last three countries are conducting open nuclear tests and declaring that they have nuclear weapons.

The NPT contains three basic principles: non-proliferation, disarmament and peaceful use.

Table 2.

Definitive principles in the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (comoposed on the basis of [11])

Basic principles	Brief description (example)
Nonproliferation	Nuclear Weapon States (according to the NPT-5: France (signed in 1992), China (1992), the Soviet Union (1968; Russia as successor to the USSR), the United Kingdom (1968) and the United States (1968), which are permanent members of the UN Security Council) have agreed not to transfer "nuclear weapons

	or other nuclear explosive devices" and "in no way to help, support or encourage" non-nuclear-weapon states regarding acquisition of nuclear weapons.
Disarmament	Article 6 "Each of the Parties to the Treaty undertakes in good faith to negotiate effective measures to stop the arms race in the near future and nuclear disarmament as well as the treaty on general and complete disarmament".
Peaceful application	The transfer of nuclear technology and materials to NPT states that have signed the agreements for the development of civilian nuclear energy programs is allowed and agreed, as long as they can demonstrate that their nuclear programs are not used to create nuclear weapons. The treaty recognizes the inalienable right of sovereign states to use nuclear energy for peaceful purposes.

4.2 International Convention for the Suppression of Acts of Nuclear Terrorism (of 14.09.2005) [26]

The convention was signed in September 2005 in New York, USA. Ukraine joined the International Convention after its ratification by the Parliamant of Ukraine in 2006 (Law of Ukraine "On Ratification of the International Convention for the Suppression of Acts of Nuclear Terrorism", adopted by the Parliamanent of Ukraine in 2006). [26]

The International Convention defines a crime in the field of the production and use of radioactive materials that pose a threat to the security. It also outlines the jurisdiction of the response to the crimes committed and the grounds for providing assistance in investigations, criminal prosecutions or extradition proceedings initiated in relation to the above-mentioned crimes, including assistance in obtaining the evidence available to them for consideration.

In accordance with Article 2 of the International Convention, any person commits an offense if she/he illegally or intentionally:

A) owns or produces a nuclear explosive device, or possesses it and intends to cause death or serious injury, or with the intention of causing material damage to property or the environment;

B) uses radioactive material or a nuclear explosive device in any way or uses or damages a nuclear facility in such a way that a release or threaten the release of radioactive material takes place with the intention of causing death or serious injury, or with the intention of causing material damage to property or the surrounding environment, or with the intention of forcing a natural or legal person, international organization or state to take or refrain from any act [26].

According to Art. 5 of the International Convention, each participant state shall take the necessary measures for:

- recognition of crimes in accordance with its national legislation of the acts established by the Convention;
- establishing the corresponding penalties for these crimes taking into account the severity of these crimes [26].

According to the Chapter 2, Article 9 of the International Convention, each participating state shall take the measures necessary to establish its jurisdiction over the abovementioned crimes when: the crime is committed in the territory of that State; offenses committed on board a ship flying with a flag of that state or an aircraft registered in accordance with the laws of that state at the time of the commission of the offense; the crime is committed by a citizen of this state [26].

4.3 Convention on the Physical Protection of Nuclear Material and Nuclear Installations [21].

The Convention was adopted at the Intergovernmental Conference in Vienna in 1980 and entered into force in 1987. Ukraine is a participant of this Convention in accordance with the Parliamanet resolution of 05.05.1993 "On Ukraine's Participation in the Convention on the Physical Protection of Nuclear Material". In 2008 Ukraine ratified the Amendment to the Convention on the Physical Protection of Nuclear Material (signed in Vienna in 2005).

The main purpose of the document is to regulate the scope of physical protection of nuclear material during use, storage and transportation, and to prevent illegal possession of nuclear material.

According to the Convention, "each participant state within its national legislation and, in accordance with international law, takes appropriate measures to ensure to the possible extent that, when transported internationally, nuclear material that is within its territory or on board a ship or an aircraft operating under its jurisdiction, if such a ship or the aircraft are involved in carriage to or from this state, has to be defended at the appropriate levels "[21].

The Convention participants agreed to consult and co-operate directly or through international organizations with a view to improving structures or improving the maintenance of physical protection systems intended for international transportation. In addition, the states have undertaken to not export or not allow the export of nuclear material until they obtain a guarantee that this material will be protected during international transportation.

According to Article 4, Clause 4 of the Convention, "Each participant state shall, within the framework of its national legislation, apply the levels of physical protection (described in the Annex to the Convention) to nuclear material transported from one part of that State to the rest of the same State by international waters or airspace." [21].

Accordingly, the Convention establishes a list of criminal acts related to nuclear material and measures for legal assistance to victims in the event of a criminal offense.

5. Legal regulation of nuclear security in Ukraine. Relation of international legal documents with national obligations.

An important place in the state management of the nuclear security system of Ukraine in terms of European integration has been aligned with the international legal field in this area to the national obligations.

Today, Ukraine is an active participant in the international process of support and strengthening of nuclear non-proliferation and counteraction to nuclear terrorism. The

country goes deliberately towards increasing domestic standards in this area, is conducting a course on harmonization of domestic nuclear legislation with the European one.

Currently, Ukraine has a developed legislation on physical protection, but there is virtually no regulatory framework for nuclear security. Creating such a framework will enable nuclear security to occupy a suitable place in nuclear and radiation safety and to establish and maintain an appropriate nuclear security regime [24, p.59].

The nuclear energy field is regulated by a separate mechanism established by the Treaty establishing the European Atomic Energy Community (Euratom). The Euratom Treaty is quite distinct from the EU Treaty. It focuses on the development of research in the field of nuclear energy, the dissemination of information and knowledge in this area, the establishment of security standards, the provision of regular supplies and the equitable distribution of nuclear fuel, the control of the use of nuclear material for peaceful purposes, the regulation of the issue of ownership of special splitting materials, the creation of a common market for special materials and equipment, ensuring the free movement of capital for investing in the nuclear industry, etc. [31].

The development of cooperation with EU countries in the nuclear field was enforced by establishing of the Partnership and Cooperation Agreement between Ukraine and the Euroatom and its members (it has expired now) [38].

The continuation of this process was the establihing of the Agreement on cooperation between the Cabinet of Ministers of Ukraine and the European Atomic Energy Community in the field of controlled thermonuclear fusion of July 23, 1999 [39] and the Agreement on cooperation between the Cabinet of Ministers of Ukraine and the European Atomic Energy Community in the field of nuclear safety of July 23, 1999 [40].

However, the adoption of these important documents regulating the nuclear enegry sphere did not solve many problems to the end. With its criteria for nuclear safety, Ukraine is second to the Eastern European NPPs in Hungary, the Czech Republic, Slovakia, Bulgaria and even Lithuania, which operated reactors of the "Chernobyl" type (RBMK)

Obviously, the adoption of regulations should not be the only measure of state policy in the field of regulating the nuclear security system. The scientific substantiation of practical implementation of programs and appropriate financial support are necessary.

The difficult task as for today is to solve the problem of adapting national legislation regarding the prospects for the nuclear fuel cycle development in the context of the transformation of Ukraine's energy sector under the conditions of European integration. Actually, almost 35% of the EU's demand for electricity is met due to its production at NPPs, while the legal system of the EU member states maintains the established safety standards.

Ukraine has already taken significant steps in establishing international law documents with national obligations. In June 2017, the Euratom has ratified the Association Agreement between Ukraine and the EU, which means the implementation of joint projects in nuclear energy, in particular scientific ones.

Earlier steps in the process of harmonizing international legal standards in the regulation of nuclear safety were ratification by Ukraine:

1) Convention on Environmental Impact Assessment in a Transboundary Context (of 25.02.1991, ratified on 19.03.1999) [20].
2) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmenta Issues (of 25.06.1998, ratified 06.07.1999) [18].
3) Convention on Nuclear Safety; (of 17.06.1994, ratified on 17.12.1997) [23],
4) Convention on the Physical Protection of Nuclear Material and Nuclear Facilities (of 26.10.1979, entry into force for Ukraine: 05.08.1993) [21],
5) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management; (of 20.04.2000) [28],
6) Vienna Convention on Civil Liability for Nuclear Damage (of 21.05.1963, entry into force for Ukraine: 20.12.1996) [7],
7) Convention on Early Notification of a Nuclear Accident (of 26.09.1986, ratified on 30.12.1986) [19],
8) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (of 26.09.1986, ratified on 30.12.1986) [17],
9) Treaty on the Non-Proliferation of Nuclear Weapons (on 01.07.1968, entry into force for Ukraine: 05.12.1994) [11].
Separately, one shoud mention the agreements with international organizations:
1) Agreement between Ukraine and the International Atomic Energy Agency on the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (of 21.09.1995 the Agreement was ratified by the Law No. 737/97-VR of 17.12.1997) [36],
2) Additional Protocol to the Agreement between Ukraine and the International Atomic Energy Agency on the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (of 15.08.2000, ratified 16.11.2005) [12];
3) Memorandum of Understanding between Ukraine and the Commission of the European Communities on the Implementation of Technical Assistance Programs in the Field of Nuclear Safety (of 23.10.1995) [25];
4) Framework Agreement between Ukraine and the European Bank for Reconstruction and Development concerning the activities of the Chornobyl Shelter Fund in Ukraine (of 20.11.1997, ratified on 04.02.1998) [32];
5) Grant Agreement (Chornobyl NPP Nuclear Safety Project) between the European Bank for Reconstruction and Development (as a Manager of the Grant from the Nuclear Safety Account), the Cabinet of Ministers of Ukraine and the State Nuclear Regulatory Committee of Ukraine (as the recipient) (of 08.07.2009, ratified on 20.01.2010) [37].
In addition, there is a number of iinternational agreements on the transportation of nuclear materials, bilateral intergovernmental agreements, bilateral interagency agreements and others.

6. The current situation in the field of state regulation of safety of nuclear energy use in Ukraine.

The state regulation of the safety of using the nuclear energy is carried out in Ukraine accordin to the following main activities:

Table 3. Main activities in the field of state regulation of safety of nuclear energy use in Ukraine.

Main activities	**Analysis of the current situation**
1. Increased safety level of NPP operation	In the coming years, the quantitative values of the parameters for ensuring the control of the level of safety of the operating NPPs and monitoring the implementation of measures for the modernization and enhancement of safety of operating power units should be maintained at the achieved level
2. Regulation of the safety of the construction of new nuclear installations	Currently a number of new nuclear facilities are being implemented in Ukraine. These are: units No. 3 and No. 4 of the Khmelnytsky NPP, the Centralized Storage of Nuclear Fuel (CFNFP), the Storage facility for spent nuclear fuel of the dry type of the Chornobyl NPP (ISF-2), the Nuclear fuel fabrication plant, the Nuclear subcritical facility "The neutron source based on the subcritical assembly controlled by a linear electron accelerator "(Source of neutrons in Kharkiv).
3. Ensuring safety of decommissioning of the Chornobyl NPP and transforming the Shelter into an environmentally safe system	Maintenance of the appropriate level of safety during the implementation of projects for the construction of facilities for radioactive waste management at the Chornobyl NPP industrial site. The main external and internal factors that influence the development of this area of activity are the limited human and financial resources.
4. Improvement of safety of production and use of sources of ionizing radiation, safety of radioactive waste management, transportation of radioactive materials, activities on the processing of uranium ores	Strategic goals are aimed at maintaining an appropriate level of safety in the use of IRS using the minimum resources of both the regulatory body and users of IRS; maintenance of the appropriate level of safety in the operation of uranium facilities and during their elimination, conservation and re-engineering; as well as ensuring an adequate level of safety of existing and new facilities for the management of radioactive waste and determining the ability of applicants and licensees to conduct declared work in the field of radioactive waste management, subject to the relevant conditions and rules.
5. Improvement and development of normative base of regulation of nuclear and radiation safety	Currently, "hierarchical pyramids" of legislative and normative documents in the field of nuclear and radiation safety are defined regarding all major objects of state regulation of safety of nuclear energy use.
6. Ensuring the fulfillment of obligations of non-proliferation of nuclear weapons	Ukraine, as a non-nuclear-weapon state, in compliance with Article 3 of the NPT, has

by Ukraine	adopted international control over all its peaceful nuclear activities by signing an IAEA Agreement on the Application of Safeguards. In accordance with this Agreement, since 1995, the IAEA carries out inspection activities on the territory of Ukraine and verifies the compliance of reports provided by the state with the actual amount of nuclear material in the state. The formation of legislation in the area of guarantees, accounting and control of nuclear materials has now been completed. Further work in this direction is connected with its improvement and changes in the normative-legal acts of a higher level.
7. Ensuring nuclear security	The problems of ensuring nuclear security in recent years are relevant not only because of increased threats of nuclear terrorism, but also a significant increase in the process of awareness of these threats at the highest political level of the state. This was facilitated at the Washington (2010, 2016) and the Seoul (2012) Summits on Nuclear Security. The main issues of these Summits which were the prevention of nuclear terrorism, measures to prevent internal and external threats related to the damage that could be caused by malicious use of radioactive materials.

In this regard, the priority tasks of the state policy in the area of nuclear energy use related to ensuring nuclear security in the near future should be aimed at fulfilling Ukraine's international obligations in achieving the strategic goals of nuclear security, namely: minimizing the risks of committing acts of nuclear theft of nuclear material, radioactive waste and other sources of ionizing radiation, as well as strengthening the regime of non-proliferation of nuclear weapons.

Conclusions

Based on the analysis made in the regulation of the sphere of nuclear security in Ukraine in the conditions of European integration, it is necessary to accompany these important steps in public policy with concrete measures for their implementation. It is needful not to dwell on constant alignment with European standards of domestic legislation in this area and to improve the regulatory framework on physical protection and illicit trafficking of nuclear and radioactive materials.

It is important that all steps of statesmen, scientists, and specialists in the field of nuclear security should be carried out in the direction of achieving maximum level of nuclear security in Ukraine. To do this, it is necessary to have systematic regulatory control over all facilities that work with nuclear materials from their receipt (production) and use till the radioactive waste disposal. The ensuring of these issues is possible through the

development of a nuclear security culture and the implementation of high standards; professional scientific approach to vulnerability assessment, assessing the conditions of physical protection systems at nuclear installations and the creation of mechanisms for preventing and counteracting the illegal use of radioactive materials.

The prospect of further research can be scientific-theoretical and applied research and development, the content of which in would allow to analyze the need and effectiveness of the implementation of nuclear security programs in more detail and widely due to the unification of Ukrainian legislation to European standards. Particularly it concerns directions and constituent elements in all the diversity of environmental relations, on the way to realization of European aspirations of our state, taking into account the high risks and threats faced by the international community in ensuring nuclear security.

References

Атомна індустрія України (експертний висновок) / Георгій Лисиченко, Микола Штейнберг, Дмитро Чумак, Андріан Прокіп, Софія Шутяк, Ігор Маскалевич, Борис Васильківський. Осло BELLONA 2017. URL:https://network.bellona.org/content/uploads/sites/3/2017/12/ATOM_UKR_site2.pdf

Gulac O., Dubchak L., Iarmolenko I., Yanchuk J. (2019) Cooperation of Ukraine and the European Union in the Ecological Sector: Directions and Prospects. European Journal of Sustainable Development (2019). Volume 8, № 1, pp. 22-30. URL: http://ojs.ecsdev.org/index.php/ejsd/article/view/762

Gulac O., Dubchak L., Goshovska V., Goshovskyi V. (2019) New Approaches to Providing of Environmental Management in Ukraine on the Way to Euro Integration European Journal of Sustainable Development (2019). Volume 8, № 2, pp. 45-56. URL: http://ojs.ecsdev.org/index.php/ejsd/article/view/793/788

Ladychenko V., Yara O., Uliutina O., Golovko L. Environmental Liability in Ukraine and the EU European Journal of Sustainable Development (2019), Volume 8, 2, 261-267. URL: http://ojs.ecsdev.org/index.php/ejsd/article/view/810/805

Конвенція про захист прав людини і основоположних свобод. Рада Європи; Конвенція, Міжнародний документ від 04.11.1950 URL: https://zakon.rada.gov.ua/laws/show/995_004

Базельська конвенція про контроль за транскордонним перевезенням небезпечних відходів та їх видаленням, ООН; Конвенція, Міжнародний документ, Перелік [...] від 22.03.1989 URL: https://zakon.rada.gov.ua/laws/show/995_022

Віденська конвенція про цивільну відповідальність за ядерну шкоду МАГАТЕ; Конвенція, Міжнародний документ від 21.05.1963 Набуття чинності для України: 20.12.1996. URL: https://zakon.rada.gov.ua/laws/show/995_006

Договір про заборону випробувань ядерної зброї в атмосфері, у космічному просторі та під водою, (ООН; Договір, Міжнародний документ від 05.08.1963 URL: https://zakon.rada.gov.ua/laws/show/995_376)

Договір про заборону розміщення на дні морів і океанів та в його надрах ядерної зброї та інших видів зброї масового знищення ООН; Договір, Міжнародний документ від 11.02.1971 URL: https://zakon.rada.gov.ua/laws/show/995_385

Договір про заснування європейського співтовариства з атомної енергії (Євратом), підписаного у 1957 році [Договір, Міжнародний документ. Від 25.03.1957 URL: https://zakon.rada.gov.ua/laws/card/994_027

Договір про нерозповсюдження ядерної зброї (ДНЯЗ) ООН; Договір, Міжнародний документ від 01.07.1968 Набрання чинності для України 05.12.1994 URL: https://zakon.rada.gov.ua/laws/show/995_098

Додатковий протокол до Угоди між Україною та Міжнародним агентством з атомної енергії про застосування гарантій у зв'язку з Договором про нерозповсюдження ядерної зброї.; Протокол, Міжнародний документ від 15.08.2000. Ратифікація 16.11.2005. URL: https://zakon.rada.gov.ua/laws/card/951_002

Закон України «Про використання ядерної енергії та радіаційну безпеку» Закон України від 08.02.1995 № 39/95-ВР URL: https://zakon.rada.gov.ua/laws/show/39/95-%D0%B2%D1%80)

Кодекс поведінки щодо забезпечення безпеки і збереження радіоактивних джерел, МАГАТЕ; Договір, Кодекс, Перелік [...] від 08.09.2003 URL: https://zakon.rada.gov.ua/laws/show/951_001

Конвенція про відповідальність перед третьою стороною в галузі ядерної енергії ОЕСР; Конвенція, Міжнародний документ від 29.07.1960. URL: https://zakon.rada.gov.ua/laws/show/994_006

Конвенція про додаткове відшкодування за ядерну шкоду, МАГАТЕ; Конвенція, Міжнародний документ від 12.09.1997 URL: https://zakon.rada.gov.ua/laws/show/951_010;

Конвенція про допомогу в разі ядерної аварії або радіаційної надзвичайної ситуації, МАГАТЕ; Конвенція, Міжнародний документ від 26.09.1986 Ратифікація від 30.12.1986 URL: https://zakon.rada.gov.ua/laws/show/995_027

Конвенція про доступ до інформації, участь громадськості в процесі прийняття рішень та доступ до правосуддя з питань, що стосуються довкілля. Конвенція Міжнародний документ від 25.06.1998. Ратифікація від 06.07.1999 URL: https://zakon.rada.gov.ua/laws/card/994_015

Конвенція про оперативне оповіщення про ядерну аварію, МАГАТЕ; Конвенція, Міжнародний документ від 26.09.1986 Ратифікація від 30.12.1986 URL: https://zakon.rada.gov.ua/laws/show/995_026

Конвенція про оцінку впливу на навколишнє середовище в транскордонному просторі, ООН; Конвенція, Міжнародний документ від 25.02.1991 Ратифікація від 19.03.1999, підстава - 534-XIV URL: https://zakon.rada.gov.ua/laws/show/995_272

Конвенція про фізичний захист ядерного матеріалу та ядерних установок. МАГАТЕ; Конвенція, Міжнародний документ від 26.10.1979, 1980 Набуття чинності для України: 05.08.1993. URL: https://zakon.rada.gov.ua/laws/show/995_024

Конвенція про цивільну відповідальність в галузі морських перевезень ядерних матеріалів ООН; Конвенція, Міжнародний документ від 17.12.1971 URL: https://zakon.rada.gov.ua/laws/show/995_125

Конвенція про ядерну безпеку, ООН; Конвенція, Міжнародний документ від 17.06.1994 Ратифікація від 17.12.1997 URL: https://zakon.rada.gov.ua/laws/show/995_023

Кузмяк І. Я., Кравцов В. І., Печериця О. В., Пасека О. В. Ядерна захищеність: синонім фізичного захисту чи складова ядерної та радіоактивної безпеки? // Ядерна та радіаційна безпека 2(74).2017 – с.51-59 - URL: http://www.sstc.com.ua/documents/journal/2017/2/text/10_2_2017_text.pdf

Меморандум про порозуміння між Україною та Комісією Європейських Співтовариств з питань виконання програм технічної допомоги в сфері ядерної безпеки; Меморандум, Міжнародний документ від 23.10.1995. URL: https://zakon.rada.gov.ua/laws/card/994_758

Міжнародна конвенція про боротьбу з актами ядерного тероризму, ООН; Конвенція, Міжнародний документ від 14.09.2005 URL: https://zakon.rada.gov.ua/laws/show/995_d68

Міжнародна Конвенція про відповідальність операторів ядерних суден, (ООН; Конвенція, Міжнародний документ від 25.05.1962 URL: https://zakon.rada.gov.ua/laws/show/995_241

Об'єднана конвенція про безпеку поводження з відпрацьованим паливом та про безпеку поводження з радіоактивними відходами, ООН; Конвенція, Міжнародний документ від 05.09.1997 Ратифікація від 20.04.2000 URL: https://zakon.rada.gov.ua/laws/show/995_335

Павлов Д.М. Забезпечення фізичної безпеки ядерних обєктів в Україні в умовах зростання військово-терористичної загрози: організаційно-правовий аспект. // Юридична наука. 2015. № 2. С.21-27. URL: file:///C:/Users/Serg/Downloads/jnn_2015_3_5.pdf

Поправка до Конвенції про фізичний захист ядерного матеріалу, МАГАТЕ; Поправки, Міжнародний документ від 08.07.2005 URL: https://zakon.rada.gov.ua/laws/show/951_013

Про Загальнодержавну програму адаптації законодавства України до законодавства Європейського Союзу. Перелік актів законодавства України та acquis Європейського Союзу від 18.03.2004. URL: https://zakon.rada.gov.ua/laws/show/ru/1629%D0%B3-15

Рамкова угода між Україною та Європейським банком реконструкції та розвитку стосовно діяльності Чорнобильського фонду «Укриття» в Україні; Угода, Міжнародний документ від 20.11.1997, Ратифікація від 04.02.1998. URL: https://zakon.rada.gov.ua/laws/card/996_004

Резолюція 47/68 Генеральної Асамблеї ООН "Принципи, що стосуються використання ядерних джерел енергії у космічному просторі" ООН; Резолюція, Принципи, Міжнародний документ від 15.12.1992. № 47/68. URL: https://zakon.rada.gov.ua/laws/show/995_492

Статут Міжнародного агентства по атомній енергії, затвердженим 23 жовтня 1956 року (МАГАТЕ; Статут, Міжнародний документ від 26.10.1956. URL: https://zakon.rada.gov.ua/laws/show/995_164

Угода про асоціацію між Україною, з однієї сторони, та Європейським Союзом, Європейським співтовариством з атомної енергії і їхніми державами-членами, з іншої сторони: Закон України від 16.09.2014 р. № 1678-VII // Відомості Верховної Ради України. 2014 р. № 40. Ст. 2021.

Угода між Україною та Міжнародним агентством з атомної енергії про застосування гарантій у зв'язку з Договором про нерозповсюдження ядерної зброї; Угода, Міжнародний документ від 21.09.1995. Угоду ратифіковано Законом N 737/97-ВР від 17.12.97. URL: https://zakon.rada.gov.ua/laws/show/995_028

Угода про грант (Проект ядерної безпеки Чорнобильської АЕС) між Європейським банком реконструкції та розвитку (як розпорядником коштів гранту з Рахунка ядерної безпеки), Кабінетом Міністрів України та Державним комітетом ядерного регулювання України (як одержувачем); Угода, Міжнародний документ від 08.07.2009, Ратифікація від 20.01.2010. URL: https://zakon.rada.gov.ua/laws/show/985_018

Угода про партнерство і співробітництво між Україною і Європейськими Співтовариствами та їх членами (наразі втратив чинність). URL: https://zakon.rada.gov.ua/laws/show/998_012

Угода про співробітництво між Кабінетом Міністрів України та Європейським співтовариством з атомної енергії в галузі керованого термоядерного синтезу від 23 липня 1999 р. Угода, Міжнародний документ, URL: https://zakon.rada.gov.ua/laws/card/994_152

Угода про співробітництво між Кабінетом Міністрів України та Європейським Співтовариством з атомної енергії в галузі ядерної безпеки від 23 липня 1999 р. Угода, Міжнародний документ, URL: https://zakon.rada.gov.ua/laws/card/994_151

Шевцов А.І., Земляний М.Г., Дорошкевич А.З. Ядерна безпека в Україні та Євроінтеграційні процеси // Стратегічна панорама. 2004. № 4 . URL: http://old.niss.gov.ua/book/title.htm