International Journal of Diplomacy and Political Relations, 2024, 82-90
https://pubjournals.com/IJDPR
Volume: 1 | Number: 4 (2024) October

Some Legal Issues of Environmental and Human Health Protection During the Construction of Atom Power Plants in Uzbekistan

Nishonov Abdulloh Ubaydulloh O'g'li*
Lecturer at the Department of Environmental Law, Tashkent State Law University, Tashkent, Uzbekistan

***Correspondence :**
Nishonov Abdulloh Ubaydulloh O'g'li
abdullohnishonov007@gmail.com

Received: 3 August 2024
Accepted: 12 September 2024
Published: 29 October 2024

Abstract
This study examines the significance and future prospects of international legal frameworks ensuring environmental safety in nuclear energy use. Given Uzbekistan's initiative to construct its first nuclear power plant, the research highlights relevant international agreements the country has ratified and identifies legal gaps requiring further adherence. Using a legal-analytical approach, the study evaluates compliance measures and proposes recommendations for strengthening Uzbekistan's environmental safety obligations. The findings emphasize the need for broader participation in international conventions to enhance nuclear energy governance. This research contributes to policy development by offering insights into improving legal frameworks for sustainable nuclear energy management.

Keywords
Nuclear power, Nuclear power plant, Small-capacity nuclear power plant, IAEA, Ratification, Implementation, International documents, Environmental security, Nuclear vulnerability, "Uzatom", "Rusatom".

Introduction

Today, against the backdrop of rapid economic growth in countries, the scarcity of natural resources is becoming a pressing issue in the global community. Countries are considering the use of alternative energy as the most optimal way to preserve their natural resources and meet their energy needs. The utilization of nuclear energy as an alternative energy source is gaining popularity among nations [1]. Atomic energy is the energy contained in atomic nuclei and released during nuclear reactions and radioactive decay. As countries accelerated the construction of nuclear power plants (hereinafter referred to as NPPs), international documents were adopted by the global community to regulate the use of nuclear energy and prevent environmental damage. The Republic of Uzbekistan is also developing energy production from renewable sources (solar, wind, water). However, the country's economic development and the steadily growing population indicate an

increase in energy demand in the future [2].

In this regard, there are opinions that Uzbekistan may face energy-related problems and high levels of environmental pollution in the future. It is also necessary to address electricity shortages in developing countries and ensure the supply of sufficient resources for small businesses. Therefore, measures are being taken to construct and operate a nuclear power plant in our country. On this matter, since 2018, after lengthy negotiations, cooperation has been established between "Uzatom" and "Rosatom," and Uzbekistan, as a country building a nuclear power plant, has ratified international documents adopted at the global level. However, Uzbekistan still has work to do in protecting the environment while using nuclear energy, as evidenced by the existence of international documents yet to be ratified that aim to fully regulate this activity, and the incomplete formation of the regulatory legal framework. For this reason, we will attempt to provide detailed information on this topic in this article.

Nuclear energy is one of the crucial directions in ensuring energy stability and economic development for many countries. Therefore, several countries are now focusing on the use of nuclear, solar, and wind energy as alternatives, which are relatively more stable and efficient compared to traditional electricity sources. In particular, nuclear power plants represent a new step in this direction, and the fact that our country is gradually entering this field indicates that the need for legal regulation in this sphere is important not only for Uzbekistan but also for other countries. However, nuclear power plants are not limited to just bringing benefits. More detailed information about this will be provided below. For the energy system to function sustainably and the economy to grow, our country needs to provide itself with basic energy sources in addition to renewable energy sources. Globally, we are observing an increasing interest in the creation of new nuclear power capacities, both high-powered nuclear power plants and small modular reactors, through leading countries in the field of nuclear power plants such as Japan, South Korea, France, and Russia.

Methods

This study examines issues related to the legal protection of the environment and human health in the Republic of Uzbekistan during the construction of nuclear power plants. The research is based on the following methodological approaches: Firstly, an analysis of the national legal framework for environmental and human health protection during the construction of nuclear power plants is conducted, identifying existing problems and developing proposals for their resolution. Secondly, the study employs qualitative legal analysis, utilizing comparative and normative-legal analysis methods. The following analytical methods were used in the research: Existing legislative acts in Uzbekistan were studied, and regulatory legal documents were analyzed to assess their effectiveness and compliance with international standards. A comparative analysis method was used to compare Uzbekistan's legislation with the legislative systems of developed countries, such as Russia, France, and Japan. Additionally, the Case Study method was employed to examine environmental and health-related incidents associated with nuclear power plants in other countries.

Results and Discussion

As of May 2024, more than 440 nuclear power plants are operating in 32 countries [3]. There is clear information and evidence regarding the extent to which these nuclear power plants pose a threat to nature. Nuclear power plants release radionuclide waste during energy production, which is considered dangerous to the lives of surrounding animals, plants, and humans. When discussing international standards, it is necessary to provide information about the International Atomic Energy Agency. It was established in 1957 as an intergovernmental organization to regulate the proper and safe use of atomic energy and prevent its use in military operations. This organization has developed safety standards and regulations for the use of atomic energy.

These radioactive wastes are considered extremely dangerous to nature and human life. According to scientist Shirley Crow, nuclear energy is better than fossil fuel energy, but nuclear energy is not clean at all. We don't know what to do with nuclear energy waste, and this can be dangerous. This view is well-founded because if radioactive waste were to spread into the environment, it could lead to unprecedented catastrophes. For this reason, scientist Shirley Crow favors energy sources such as wind and solar [4].

However, scientist Michael Burgess believes that nuclear energy will help provide the electricity necessary for our growing economy without increasing waste [5]. Rules on radioactive waste have been established to address the risks highlighted by scientist Shirley Crow. The above are the main principles in the field of ensuring nuclear energy safety and are mandatory only for states that produce and use nuclear energy. Currently, 176 countries are members of the International Atomic Energy Agency (IAEA). According to statistics recorded in 2023, nuclear power plants exist in 32 countries worldwide [6]. For these 32 countries, the safety standards and

rules adopted by the International Atomic Energy Agency are mandatory.

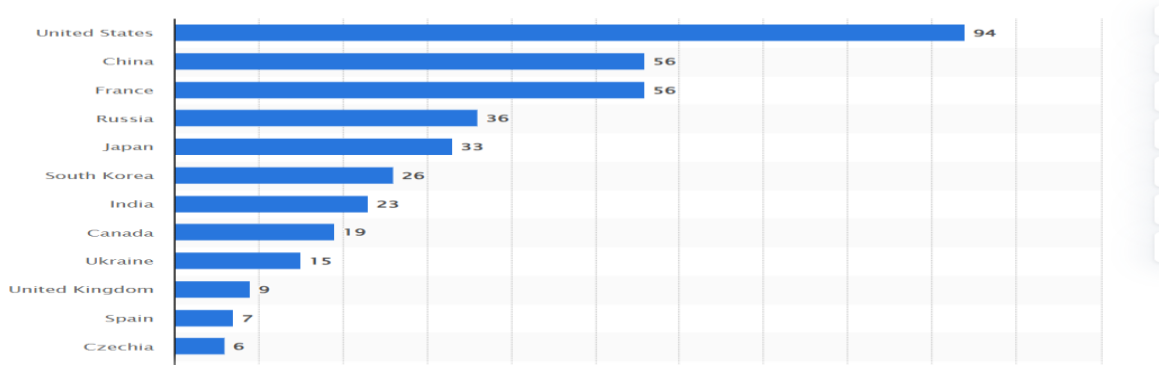

Figure 1. Number of Operational Nuclear Reactors by Country

According to the statistical data presented above, the United States is leading in the utilization of nuclear energy, and it can be observed that one-fourth of the world's nuclear power plants are situated within the territory of the USA.

Convention on Nuclear Safety. This Convention was adopted by the IAEA in 1994 following the 1986 Chernobyl incident, with the purpose of ensuring the safety of nuclear energy. The Convention consists of 35 articles, with Article 15 obligating states to study the radiation effects from nuclear power plants on workers and the population, and to ensure that radiation exposure is maintained at a moderately low level and does not affect anyone. Article 17 establishes requirements for the construction of nuclear power plants, with the second requirement being the condition to assess the impact of nuclear power plant activities on individuals, society, and the environment, and to adequately mitigate harmful factors. According to Article 16, any nuclear power plant must undergo testing before operation and can only be commissioned with the permission of the supervisory commission.

Convention on the Physical Protection of Nuclear Material. This convention was initially adopted in 1979 and amended in 2005. The purpose of the Convention is to eliminate the risks associated with nuclear materials and nuclear power plants, and to prevent potential hazards they may pose to humanity and the environment. A distinctive feature of this convention is that it defines crimes related to atomic energy and nuclear power plants. Article 7 of the Convention specifies the following acts as crimes subject to punishment:

Illegal acquisition, possession, use, transfer, alteration, destruction, distribution of nuclear materials, and causing death or serious harm; theft of nuclear material; obtaining nuclear material through threats or use of force. Theft of nuclear material; Obtaining nuclear material by threat or use of force [7]. The Convention allows for the criminalization of the aforementioned acts to be established in the national legislation of states. It also stipulates that these actions must be committed intentionally. Furthermore, the Convention defines crimes related to the transportation of nuclear materials and methods for their safe transportation without harming the environment,

while prohibiting the transportation of nuclear materials in a manner that is environmentally harmful. The significance of this convention lies in its ability to deter states and individuals from committing crimes related to nuclear and nuclear power plants, thereby preventing actions that could potentially damage the environment.

Additional Agreement on the Management of Radioactive Waste and Spent Nuclear Fuel This convention was adopted in 1997 and entered into force in 2001. It is well-known that radioactive waste is generated during the production of nuclear energy. Paragraph 4 of Article 4 of this document obligates participating States to incorporate internationally recognized standards and regulations related to nuclear power plants into their national legislation. It also mandates the support and implementation of protection methods outlined in international documents at the national level. Furthermore, the document establishes the procedure for the disposal of radioactive waste and spent fuel, stipulating that the disposal process must not pose a threat to humanity or the environment, and must be carried out in an internationally recognized manner under the supervision of specialists and a regulatory body.

The significance of this document lies in its ability to prevent environmental hazards associated with radioactive waste and spent fuel after the production of nuclear energy. The importance of this document lies in preventing the danger to the environment of radioactive waste and spent fuels after the development of nuclear energy. Measures taken by Uzbekistan as a country building an atomic power plant. Currently, the global community is developing the use of nuclear energy to meet energy needs, and measures are being taken to build nuclear power plants in various countries. The fact that the Republic of Uzbekistan is a member of the international intergovernmental organization IAEA and intends to increase the number of states with nuclear power plants by one more is a clear example of the indifference of our government to this issue.

To date, the Republic of Uzbekistan has ratified only a few international documents on nuclear energy, and the international document ratified by Uzbekistan is the IAEA Statute.

The IAEA Statute is the first international document on nuclear energy that Uzbekistan ratified at the international level. By ratifying this international document on August 14, 1994, Uzbekistan became a full member of the International Atomic Energy Agency and assumed several obligations as defined in the statute, such as the peaceful use of atomic energy and ensuring nuclear safety. The statute outlines the goals and objectives of the IAEA, the organization's bodies, and membership in the organization.

In recent years, our country has been implementing measures to construct nuclear power plants and ratify international conventions. The decree issued by President Shavkat Mirziyoyev on February 7, 2019, "On approval of the Concept for the Development of Nuclear Energy in the Republic of Uzbekistan for 2019-2029," serves as a crucial legal document in ensuring the execution of these initiatives. A "Roadmap" for implementing the concept approved by the decree has also

been developed. It outlines specific measures for developing the national nuclear infrastructure. The introduction of the concept states that nuclear energy is considered environmentally friendly, and highlights the difference between nuclear power plants and thermal power plants. Unlike thermal power plants, nuclear power plants do not produce substances harmful to the environment, such as sulfur, carbon, and ash. The main goal of the concept is to provide the country with a reliable, safe, economically efficient, and environmentally friendly source of electricity by 2030.

This will be achieved by establishing a national nuclear energy sector with developed infrastructure, constructing a nuclear power plant with a total capacity of 2.4 GW, and initiating its safe operation. The tasks set for achieving this goal are as follows: creating a legal framework to regulate nuclear energy; constructing and commissioning the first nuclear power plant; ensuring environmental protection and radiation safety for the population in the use of nuclear energy; developing nuclear science and technology; and addressing other important related tasks [8].

As we can see, the concept itself has set the task of creating a national foundation in this field through the development of regulatory legal documents governing nuclear energy. In other words, this sector is not yet fully established in Uzbekistan. There are many shortcomings and a considerable amount of work that needs to be done. The international documents to which the Republic of Uzbekistan should accede on the topic of the article are outlined in the "Roadmap" of the aforementioned concept. According to it, the Republic of Uzbekistan should accede to the following international conventions in the field of nuclear security or implement their provisions into the legislation of the Republic of Uzbekistan: Convention on Nuclear Security, Vienna Convention on Civil Liability for Nuclear Damage, Convention on Rapid Notification of Nuclear Accidents, Convention on the Assistance in Case of Nuclear Accidents or Radiation Accidents.

Negotiations are underway at meetings of the "Uzatom" Agency regarding joining the aforementioned conventions, and according to information provided by the agency, Uzbekistan is expected to ratify these conventions in the near future. The significance of these conventions lies in ensuring the safe operation of nuclear facilities in territories of states where nuclear power plants operate and other nuclear-related activities are carried out, thereby achieving the primary goal of safeguarding the environment and human safety through the prevention of nuclear accidents. To prevent an incident like the 1986 Chernobyl disaster, which was the reason for adopting these conventions in world history, from occurring on Uzbekistan's territory, Uzbekistan should review international documents on nuclear energy and either ratify them or implement their provisions into Uzbekistan's legislation.

There are several updates regarding the ongoing work in the field of nuclear energy. At a conference held on October 15, 2024, Azim Akhmedkhadjaev, Director of the "Uzatom" Atomic Energy Agency, delivered a speech in which he announced that Uzbekistan is considering the

construction of small-capacity nuclear power plants (hereinafter referred to as SCNPP) in various regions of the country.

Furthermore, to ensure stable operation of energy systems and successful integration of nuclear power plants, it is necessary to develop systemic and emergency automation tools, expand energy networks, and create maneuverable sources of electricity generation. He put forward these ideas and proposed the use of small modular reactors as a solution to these problems: they are distinguished from large reactors by their high safety combined with passive reactive safety systems, and are easily adaptable to the energy system due to their small technical capacity, which is equal to the power of traditional gas and coal power units.

On May 27, 2024, as part of Russian President Vladimir Putin's visit to Tashkent, an agreement on the construction of a nuclear power plant was signed between the Directorate for Nuclear Power Plant Construction and Atomstroyexport (Rosatom's engineering division). Currently, Uzatom is actively working with Rosatom on a project to build a small nuclear power plant. Furthermore, during the conference, President Shavkat Mirziyoyev's speech emphasized the vital importance of the small nuclear power plant construction project, highlighting its critical significance: "Almost all leading countries in the world are ensuring their energy security and sustainable development through nuclear energy. If we consider the prospects for Uzbekistan's entry into a new stage of development, this project is of vital importance for our country, which possesses large uranium reserves and exports it to third countries. [11]"

Following this meeting, a gathering took place on June 26, 2024, during which a protocol was signed regarding the procedure for the entry into force of the contract for the construction of a 6-block low-power nuclear power plant. While inspecting the site where infrastructure facilities for the 6-block nuclear power plant are planned to be built in autumn, the delegation discussed preliminary matters concerning the implementation of the agreement. These matters included starting construction work at the headquarters site at the specified time and beginning the development of a construction workers' settlement fully equipped with all necessary infrastructure.

Conclusion

The depletion of natural resources and the growing demand are driving the use of atomic energy. However, it can pose a serious threat to the environment. To prevent this, the international community has adopted a number of international documents that establish rules for the development and use of nuclear energy, as well as for minimizing the environmental risks of waste products. The practical implementation of these norms is monitored by a commission approved by the IAEA. The state policy of the Republic of Uzbekistan in the field of nuclear energy is considered the most effective and rapid among Central Asian countries. For the future of our country, with the

aim of preserving nature and providing the population with sufficient electricity sources, cooperating with experienced countries and developing a project for the construction of nuclear power plants in our country based on their experiences will ensure the safe and promising operation of the nuclear energy industry in the future.

Recommendations:

The official website of the IAEA provides information about a 12-day mission of an expert group sent by the agency to Uzbekistan to review the development of the country's nuclear energy program infrastructure, along with their final conclusions. According to the final conclusion, Uzbekistan is making significant progress in the field of nuclear energy. The report notes that Uzbekistan has taken measures to construct a nuclear power plant on its territory, improve its legal and regulatory framework, and strengthen the regulatory body. However, the experts also made suggestions and recommendations regarding some shortcomings and aspects that require more attention. After reviewing all the information, we would also like to offer our recommendations.

Firstly, Uzbekistan should accede to the international conventions in the field of nuclear energy, including the "Convention on Nuclear Safety," the "Convention on Civil Liability for Nuclear Damage," the "Convention on Early Notification of a Nuclear Accident and its Protocol," and the "Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency."

Secondly, it is necessary to develop and strengthen effective norms in the national legislative framework based on international documents, train qualified personnel in the field of nuclear energy, send them to foreign countries for experience exchange, and improve regulatory provisions to ensure their monthly salaries are adequately set based on the level of occupational hazard.

Thirdly, it should become a party to the Additional Agreement on the Management of Radioactive Waste and Spent Nuclear Fuel. Since the waste produced during nuclear energy generation is highly hazardous to the environment, it is necessary to incorporate the standards outlined in the agreement into domestic legislation to minimize this risk. Additionally, emergency response centers should be established in areas near nuclear power plants to address potential emergencies or accidents that may occur at these facilities.

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