

Nuclear Law as a Discipline in Law

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Abstract: The civil nuclear industry has developed rapidly and has made remarkable achievements all over the world since the 1940s. The nuclear legal system plays an important role in promoting and guaranteeing the development and utilization of the nuclear industry. The implementation and development of the nuclear legal system form the corresponding discipline of nuclear law. The development of nuclear law as a new interdiscipline needs a timely revision in law education. Therefore, this paper starts from the analysis of nuclear law as a branch law and examines nuclear law as a legal discipline. Nuclear law is a new interdiscipline of the legal science discipline system, which needs to be improved. In order to set up the discipline of nuclear law, it is necessary to make the definition, object and characteristics of the discipline, and to design in terms of teachers and the curriculum so as to make the discipline of nuclear law more mature and realize its value as a law discipline.

Key Words : *nuclear law, legal system, inter-discipline*

Nuclear energy is one of the greatest discoveries of mankind in the 20th century. It has been more than seventy years since the world's first nuclear power plant was put in operation. Safe use of nuclear energy is of great significance for ensuring energy security, reducing greenhouse gas emissions, and achieving power structure optimization and sustainable development. The rapid development of the civil nuclear technical control to ensure its safe operation, as well as legal protection of its utilization and supervision, so that it can develop on track. In fact, since the advent of nuclear energy in the 1940s, nuclear energy legal issues have been accompanied together. For example, the radioactive risks caused by the use of nuclear energy will bring health and safety hazards

to unspecified public. The licensing requirements for the operation of nuclear facilities, the transportation and disposal of nuclear waste, etc. are in great need of legal regulation and usually can only be resolved by law.^[i] The safe and peaceful use of nuclear energy in any particular country can only be guaranteed through the promulgation and implementation of an effective national nuclear legal system.^[ii] Countries advanced in civil nuclear development should also be countries with relatively developed nuclear legal systems. In the United States, France, Japan and other countries, the nuclear legal system plays an important role in promoting and guaranteeing the development and utilization of civil nuclear energy. It can be said that the vigorous development of civil nuclear industry

has bred nuclear law as a special field of law. The legislation, implementation and development of each legal system breeds a corresponding legal theory and discipline. Nuclear law should not be an exception, which requires response and updates from education in law. The discipline of nuclear law is a new inter-discipline that stands out from the traditional disciplines of law and forms a system of its own. Therefore, in order to meet the growing needs from world's civil nuclear industry, and to develop and enrich the legal discipline system, it is recommended to add nuclear law to the legal curriculum in some appropriate colleges and universities, as a supplement to civil law, criminal law, procedural law and other traditional law disciplines. Then, how to define nuclear law, what are the differences and connections between nuclear law and related laws, what are the object and characteristics of nuclear law, and how to develop this new inter-discipline is the focus that this paper will address.

1. The Evolution and Definition of Nuclear Law as a Department Law

The advent of nuclear law is much later than traditional department laws. Since the 1940s, nuclear energy has developed exceedingly rapidly from theoretical research to military utilization. Therefore, countries conducting nuclear energy research and development at that time were all longing for laws that could regulate and protect nuclear-related activities. On December 7, 1945, New Zealand, still under British colonial rule, promulgated the world's first "Atomic Energy Law", which mainly stipulated that the development of natural uranium mines and fission research activities must be approved by the government. In 1946, the United States promulgated its first "Atomic Energy Act," which required militarized management of nuclear energy development and restrict civilian use. With the continuous development of the nuclear industry, the legislative purpose of the Nuclear Law, the "Atomic Energy

Law" has changed fundamentally. The promulgation and implementation of the Atomic Energy Act of 1954 in the United States marked that the use of nuclear energy in the United States had evolved from military purposes to peaceful use (civil nuclear industry). The above system has laid a foundation for the development of the civil nuclear industry worldwide. With the purpose shifting from military to civilian, from experimentation to industrialization, from promotion to supervision, from government monopoly to commercial competition, the nuclear law is constantly being adjusted and developed with the times. Except for the basic nuclear legal system mentioned above, a large number of various nuclear-related special laws and regulations have been emerging, especially nuclear-related international treaties. A nuclear legal department centered on the development and safety of the civil nuclear industry has gradually formed.

When determining the name of the department's law, the use of the term "nuclear", "nuclear energy" or "atomic energy" is often inconsistent and ambiguous and causes confusion. It is not only a scientific issue but also a historical one. From a scientific point of view, ionizing radiation involves the reaction of the "nucleus" in an atom. Therefore, the term "nucleus" is more accurate. However, historical evolution or public perceptions, including international law, such as the "Statute of the International Atomic Energy Agency" uses "atomic energy" as the term, and the United States, Russia, Germany, Norway, Poland, Japan, South Korea, India, Australia, New Zealand, etc prefer "Atomic Energy Law" in basic laws. Some international organizations, such as the International Atomic Energy Agency (IAEA), often use "atomic energy" written in documents for cooperation. The relevant basic laws of Spain, Ireland, Italy, the Netherlands, Sweden, Finland, Lithuania, Canada, Myanmar, South Africa, Argentina and other countries all adopt the "Nuclear Energy Law" as the legal name, and international agencies such as the OECD Nuclear Energy Agency(OECD NEA) use "nuclear energy" as well.

However, no matter which expression is adopted, they all represent the same concept in the legal system.

For nuclear energy law, or nuclear law, the most authoritative definition of nuclear law is taken from the Handbook on Nuclear Law issued by the International Atomic Energy Agency, which states that "The body of special legal norms created to regulate the conduct of legal or natural persons engaged in activities related to fissionable materials, ionizing radiation and exposure to natural sources of radiation."^[iii] This definition comprises four key elements. First, as a body of special legal norms, nuclear law is recognized as a part of general national legislation, while at the same time comprising different rules required by the special nature of the technology. Second, the element of regulation incorporates the risk-benefit approach that is central to managing activities that present both hazards and advantages for social and economic development. Third, as with all legal regimes, the special legal norms relate to the conduct of legal persons, including commercial, academic, scientific and governmental entities, as well as of individuals. The fourth element focuses on radioactivity (produced through the use of fissionable material or ionizing radiation) as the defining feature justifying a special legal regime.^[iv]

2. The differences between nuclear law and other adjacent department laws

The content of nuclear law includes energy law, environmental law, tort law, administrative law and so on, which covers such a wide legal knowledge that other discipline cannot compare. Therefore, to better understand the nuclear law, it's crucial to clarify the connection between nuclear law and other related laws that intersect with it.

Nuclear law and environmental law. Nuclear law is closely related to the environmental law, which means that the nuclear issue is closely related to the environmental issue. Environmental

protection and the protection of citizens' environmental rights are not only the most important legislative content of environmental law, but also an important content of nuclear law and the purpose of nuclear industry management. The environmental law emphasizes "prevention first", and the nuclear law uses laws and regulations to protect nuclear safety. "Prevention first" is also true to prevent nuclear and radiation damage to the environment. There are many environmental protection related provisions in the Nuclear Energy Law. Therefore, some scholars even think that nuclear law is part of environmental law.^[v] However, there is a big difference between nuclear law and environmental law. Nuclear laws and regulations are not only limited to environmental issues related to nuclear, but also include all aspects of peaceful use of nuclear. For example, one of the principles of China's Nuclear Safety Law, "defense in depth" is an important means of preventing and mitigating the consequences of nuclear accidents in nuclear safety management, but difficult to apply to other environmental protection fields.

Nuclear law and energy law. The Energy Law is a general legal term that regulate social relations in energy development, utilization, and management activities. It is based on the legalization, efficiency, and rationalization of energy development and utilization that aims to ensure energy safety, efficiency, and sustainable supply. The broad energy law includes the Basic Energy Law, Energy Conservation Law, Petroleum Law, Coal Law, Electricity Law, Nuclear Law, Renewable Energy Law, etc. Therefore, from a broad perspective, primary energy such as coal, crude oil, natural gas, coal-bed methane, hydropower, wind energy, solar energy, geothermal energy, biomass energy, and secondary energy such as electricity, heat, refined oil, and other fossil energy, renewable energy and new energy are treated equally to nuclear energy in energy law. Energy law focuses on solving basic, common, and cross-cutting issues in various energy industries, such as energy strategic planning, energy structure

optimization, energy substitution, energy security, reserve emergency, international cooperation, etc. Although the broad energy law contains most of the contents of the nuclear law, and there is a concurrence between the energy law and the nuclear law in terms of adjustment objects, the nuclear law also has its particularity. Huge damage caused by nuclear accidents is due to several reasons, such as design problems, manufacturing defects, construction and installation errors, operation and maintenance negligence, equipment failures, natural disasters, terrorist attacks, and so on.^[vi] All of these problems can lead to nuclear accidents and cause significant damage. Since nuclear damage can lead to a lot of claims and influence, and general civil tort law does not provide a full responsibility system for particularity, legislators should provide rules for this kind of damage compensation liability. ^[vii]This nuclear damage compensation system does not overlap with the energy law, and its content cannot be included in the energy law.

3. Object, Definition and Characteristics of Nuclear Law as a New Discipline

Any discipline has a clear research object and defining a specific research object is the first step to establish the discipline. Nuclear law takes the theory, practice, and development of nuclear law as the research object. A series of institutional norms and their practice and development, including domestic nuclear laws and regulation, international nuclear treaties, nuclear safety standard and etc, are all within the scope of nuclear law. Nuclear law as a separate discipline transcends the boundaries of traditional legal disciplines, and integrates law disciplines, nuclear science, and nuclear technology to solve problems in nuclear industry. ^[viii]

Therefore, the definition of nuclear law as a new discipline can be concluded as a new and intersecting law targeting theory, practice, and development of nuclear law. As an independent legal discipline with specific content, the discipline

of nuclear law involves domestic law, international law, jurisprudence, administrative law, energy law, environmental law, economic law, criminal law and other legal disciplines. As a new interdisciplinary subject, it also involves nuclear science, nuclear sociology, international relations and other natural sciences and social sciences. The subject of nuclear law will systematically summarize the basic theories and basic knowledge of utilization related laws.

The characteristics of the discipline of nuclear law are that, first of all, it is a comprehensive, exploratory, and cross-discipline law. Basic theoretical knowledge of law and natural science is required. Usually, nuclear science and nuclear technology knowledge can help understand the subject. Meanwhile, the nuclear law reflects the trend that international law and domestic law penetrate, transform and influence each other. Nuclear-related international treaties refer to national nuclear laws. Meanwhile, national nuclear laws and implementation refer to the relevant provisions of international treaties. Therefore, study of related international and national laws builds a foundation to nuclear law study.

Secondly, it is a subject requires practice. Civil nuclear industry serves the society. Talents in this area can serve enterprises and benefit civil nuclear industry as a whole. Therefore, the construction and operation of nuclear-related projects can be legally regulated and guided by the establishment of nuclear law as a discipline.

Third, nuclear law is a particularly new legal discipline that has yet to be developed and formed. As far as having been known, a test book, the second edition of "Nuclear Law" that expanded and published in 2010 on the basis of "Nuclear Facilities and Radioactive Material Law" compiled by the British scholar, Stephen Tromans QC in 1997. This book systematically summarizes the legal systems application for nuclear energy and radioactive technology in European Union and the United Kingdom and clarifies the development and

implementation of European nuclear laws. It also introduces the impact of international nuclear laws and EU nuclear laws on the UK's national nuclear laws.^[ix] "The Law of Nuclear" written by Australian scholar Helen Cook, the first edition in 2013 (reprinted in 2018) combed and studied in detail the international treaties related to nuclear law and the nuclear-related national legislation in several countries.^[x] And there are not many schools that have established a complete nuclear law course system. The oldest and most famous is the University of Montpellier in France. Since 2001, the Legal Affairs Department of the OECD NEA has cooperated with the University of Montpellier in France to organize a short-term program of nuclear law every year, focusing on a training course of nuclear safety, nuclear security, nuclear material transportation and other aspects. This training course attracts nuclear law practitioners, scholars, lawyers, and legal professionals interested in nuclear law from both member states and non-member states of OECD. As cooperation and training develops and experience accumulates, in recent years, the School of Law in the University of Montpellier has established a major in nuclear law with related systems and theories on nuclear security, nuclear material transportation, spent fuel disposal, etc. In addition, the International Law Research Center of the National University of Singapore has also conducted a systematic teaching practice on nuclear safety, nuclear security and nuclear responsibility, and had also cooperated with the Legal Affairs Department of OECD NEA to organize the nuclear law short-term school in early 2018. Therefore, there is still room for the discipline of nuclear law to be built and improved.

4. Specific plan for the Construction of Nuclear Law Discipline

First of all, colleges and universities should leverage their own advantages to set courses that reflect their own characteristics and advantages. Therefore, it is recommended that universities

renowned for nuclear physics, nuclear science and nuclear technology, reactor engineering and other nuclear technology related majors first set up curriculum for an interdisciplinary and nuclear law discipline. Only this type of institutions has the advantages in science and engineering that can be integrated into law systems to set up nuclear law curriculum and discipline.

Secondly, staff diversity. Nuclear law practitioners with rich practical experience should join faculty team through "school-enterprise cooperation". For example, hiring legal consultants from nuclear power companies to be part-time professors of nuclear law. Full-time law teachers may not be capable of explaining technical issues due to lack of practical understanding of nuclear science and technology. These part-time teachers have been engaged in nuclear-related legislation and practice for a long time and can better integrate the theory and practice of nuclear law, giving a more vivid introduction to the professional knowledge of nuclear law and industry background. For example, technical issues and nuclear safety law can be combined in teaching so that students can have firsthand knowledge to carry out nuclear law studies and research under the guidance of these professionals. This way, on one hand, it can give full play to the professional expertise and bring students a unique perspective of legal reasoning and critical thinking on nuclear legal theories and complex and changeable practices that is not available to full-time law teachers in colleges and universities.^[xi] Professionals engaged in nuclear science and technology studies in universities and research institutes also can be hired to teach background knowledge of nuclear law and technology.

Thirdly, curriculum settings. Specific curriculum types can be learned from the University of Montpellier in France. "Nuclear Law Overview" course can be set up as a basic course for the discipline of nuclear law. When the discipline is mature, international nuclear law, nuclear safety law

and standards, nuclear security law, a series of related courses including nuclear risk insurance and nuclear damage liability system, nuclear material transportation management system and radioactive waste disposal system can be added. Of course, no matter which nuclear law courses are set up, the purpose is to help students master certain nuclear science and technology knowledge to better serve country's nuclear power industry.

When designing the teaching content scope and teaching methods of nuclear law, interdisciplinarity should be noted that students understand not only relevant knowledge but also can solve civil nuclear industry issues. The development of civil nuclear industry depends on mutual learning and joint research between teachers and students. Therefore, compared with traditional civil law, criminal law and other basic departmental law directions, nuclear law courses do not have too many conceptional knowledge, but industry issues and public affairs that need to be paid attention to. Therefore, stimulating students' awareness and concerns of related public events is the main focus in nuclear law education. For example, the compensation under related legislation and procedure of Fukushima nuclear damage accident in Japan. In Japan, the Atomic Energy Basic Law states that "research, development and utilization of nuclear energy is for the purpose of peace only", and for nuclear facilities, strict regulations are stipulated on the premise of ensuring safety for each item. The check system has also been strengthened. Through the analysis and investigation of major events, specific content of the nuclear law discipline can be enriched and revised so as to encourage students' interest and enthusiasm for discussion in class. Meanwhile, students majoring in law may tends to have few interest and lack of motivation in learning nuclear science and technology so that such knowledge should be made accessible to students. Therefore, it is necessary to introduce topic discussion considering school resources and advantages. When it comes to class time arrangement, one-third of the

time can be given to basic knowledge, basic concepts, legal principles, etc., and teaching method should be combined with lectures and student preview; two-thirds of the time can be used to select topics suitable for students of the school. Task assignment, class discussion, teacher's comments, etc.

Conclusion

Rapid development of civil nuclear industry calls for nuclear law as a branch law and nuclear law discipline as a independent discipline. Nuclear law is an interdisciplinary subject that takes theory, practice, and development of nuclear law as the research object. The research object and scope of the discipline of nuclear law mainly lie in discussion on theory and practice of the national nuclear-related legal system and related international conventions. In this paper, diversified teaching team with participation of practitioners from nuclear industry is suggested in colleges and universities; for curriculum, "Nuclear Law" can first be set up as a basic course; energy industry issues and related public affairs discussion can be the pointcut in teaching method and arrangement. This paper is expected to promote nuclear law development as a discipline in on a worldwide stage.

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